

UGANDA PROTECTORATE.

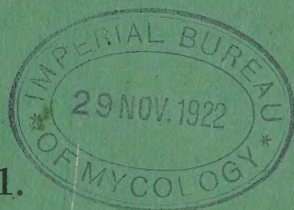
ANNUAL REPORT

OF THE

DEPARTMENT OF AGRICULTURE

FOR THE

YEAR ENDED 31ST DECEMBER, 1921.



Published by Command of His Excellency the Governor.



ENTEBBE :

PRINTED BY THE GOVERNMENT PRINTER, UGANDA.

1922.

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DEPARTMENT OF AGRICULTURE.

					<i>P.O. Box</i>	<i>Telephone</i>
					<i>No.</i>	<i>No.</i>
HEAD OFFICE	...	...	...	Kampala	53	15
MYCOLOGICAL OFFICE AND LABORATORY	...			Kampala	5	26
ENTOMOLOGICAL OFFICE AND LABORATORY	...			Kampala	5	25
BOTANICAL GARDENS AND METEOROLOGICAL OFFICE				Entebbe	60	38

EXPERIMENTAL PLANTATIONS :—

- | | |
|----------------------|-----------------------|
| 1. Kampala. | 4. Fort Portal, Toro. |
| 2. Kakumiro, Mubendi | 5. Kumi, Teso. |
| 3. Simsa, Soroti | 6. Serere, Teso. |
| 7. Bukalasa, Mengo. | |

ANNUAL REPORT, 1921.

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STAFF LIST.

<i>Director of Agriculture</i>	...	...	S. SIMPSON, B.SC., (EDIN.), M.R.A.S.E., N.D.A.
<i>Deputy Director of Agriculture</i>	...	...	L. HEWETT, M.R.A.C.
<i>Office Superintendent</i>	...	...	A. S. WIDGERY.
<i>Clerk</i>	...	...	H. G. SMITH.

GENERAL DIVISION:

Senior District Agricultural Officers :

R. G. HARPER. A. R. MORGAN.

District Agricultural Officers :

J. D. SNOWDEN. R. T. WICKHAM. (Vacant).

Assistant District Agricultural Officers :

C. HAZEL.	P. CHANDLER.	Capt. HARMSWORTH, M.C.
G. T. PHILPOTT.	F. W. HALL.	E. A. RUCK.

<i>Rubber Expert</i>	...	...	...	H. A. ASHPLANT, A.R.C.S.
<i>Coffee Expert</i>	...	...	...	C. H. LANKESTER.
<i>Ginning Inspector</i>	...	...	...	O. E. LORD.
<i>Engineer</i>	...	...	...	Capt. F. G. R. LE PLA, M.C.
<i>Ploughing Instructor</i>	...	...	...	A. FISHBURN.

BIOLOGICAL DIVISION:

<i>Mycologist</i>	...	...	...	W. SMALL, M.B.E., M.A., B.SC., F.L.S.
<i>Botanist</i>	...	...	...	T. D. MAITLAND (not yet arrived).
<i>Entomologist</i>	...	...	...	H. HARGREAVES, A.R.C.S., D.I.C., F.E.S.

BOTANICAL DIVISION:

<i>Curator, Botanic Gardens, Entebbe</i>			T. D. MAITLAND (not yet arrived).
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CLERICAL STAFF:

W. NORONHA	J. C. DE SOUZA	P. S. J. SILVA.
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ANNUAL REPORT

OF

THE DEPARTMENT OF AGRICULTURE,

UGANDA PROTECTORATE,

For the Year ended 31st December, 1921.

Staff.

The following table shews staff movements during the year under review:—

<i>Name.</i>	<i>Office.</i>
Mr. L. Hewett ...	Deputy Director of Agriculture, returned from leave 4th April.
Mr. R. G. Harper ...	Senior District Agricultural Officer, returned from leave 24th April.
Mr. W. Small ...	Mycologist, returned from leave 29th March.
Mr. A. S. Widgery ...	Office Superintendent, returned from leave 28th February.
Mr. C. H. Lankester ...	Coffee Expert, arrived on appointment, 10th January.
Mr. H. Ashplant ...	Rubber Expert, arrived on appointment, 29th January.
Mr. O. E. Lord ...	Ginning Inspector, appointed locally, 5th May.
Capt. F. G. R. le Pla, M.C.	Engineer, appointed locally, 14th August.
Mr. C. Hazel ...	Assistant District Agricultural Officer, went on leave 16th August.
Mr. P. Chandler ...	Assistant District Agricultural Officer, went on leave 4th October.
Mr. H. G. Smith ..	Clerk, went on leave 4th October.
Mr. C. H. Lankester ...	Coffee Expert, went on leave 1st November, termination of appointment on completion of mission.
Mr. H. Ashplant ...	Rubber Expert, went on leave 26th April, termination of appointment on completion of mission.

General.

The year has been one of trade and financial depression in Uganda as in other parts of the world. Cotton, the most important crop in the country, suffered severely by the fall in prices, but, in spite of the collapse, it remained, except in a few remote parts, saleable, and formed for several months almost the single exception in this respect amongst Uganda's native-grown products.

Spring and autumn rains were light, and the early cessation of the latter in the Eastern Province had a detrimental effect on the late planted cotton, and this, taken with the reduced acreage, foreshadowed a small crop for 1922.

The change in currency, whereby rupees were called in and florins introduced, also had a very disturbing effect throughout the country. A serious outbreak of plague in Busoga during the cotton-selling months was an adverse factor which dislocated trade.

Labour became more plentiful, and by the end of the year was ample. A temporary increase to the staff of the Department was made by the appointment of Rubber and Coffee Experts, but both these officers completed their investigations and left the country before the close of the year. Their reports have been published separately.

Loan Funds for Agricultural work were considerably curtailed, and but a small proportion of the amount estimated under this heading was available, but it is very evident that development work in agriculture is sorely needed if the country is to make continued progress, and it is hoped that more money will be forthcoming next year.

Coffee and Rubber Plantations were severely hit by the depression, and considerable numbers were closed down.

Hides were practically unmarketable, and simsim and ground-nuts were in poor demand. Chillies, on the other hand, rose to higher prices, and formed a very useful money crop for the natives in the districts where they are grown.

Exports.

The total value of the exports for the year was £1,539,538, compared with £4,134,136 for the previous nine months, which is a decrease of £2,594,598, almost entirely due to the fall in the price of cotton.

Details and comparative statements of exports will be found in Appendices Nos. X. and XI.

The principal products of the export table are represented by the following and the percentage of each compared with the total exports is given:—

		Cwts.		£	%
Cotton, Ginned	...	290,592	...	1,281,357	83.229
Coffee	...	48,856	...	94,038	6.108
Ivory	...	93,198	...	46,599	3.027
Chillies	..	7,355	...	30,213	1.964
Cotton Seed	...	97,311	...	22,113	1.437
Skins, Goat	...	2,996	...	20,034	1.301
Simsim	...	20,060	...	18,907	1.228
Hides	...	1,985	...	6,211	.404
Rubber	...	74,002	...	4,441	.288
Other Exports	...	—	...	15,625	1.014
		TOTAL	...	<u>£1,539,538</u>	

Cotton Production.

The following figures shew the actual exports of lint cotton for the last five years:—

Year ended 31st March,		Cwts.	£
1918	...	99,395	537,083
" " " "	1919	98,188	965,951
" " " "	1920	130,464	1,209,663
" " " December,	1920	186,381	3,919,453
" " " "	1921	290,592	1,281,357

Cotton Buying.

The very high prices obtained for cotton in the previous season gave a great impetus to the native in increasing his area under this crop, so that output for the 1921 season easily exceeded any previous year's production, and totalled over 81,000 bales of 400 lbs. each, and nearly 30,000 in excess of the previous season.

Unfortunately the large crop coincided with the fall in prices in the European market, and so very low rates were paid to the grower for his seed cotton, and in some of the outlying parts buyers were very few and late in appearing.

In the Eastern Province, the general average price was about 3 cents per pound, although when the season opened much of the Lango District cotton realised Fls. 8/- before the price fell to a much lower level. In Buganda, in the Mengo and Entebbe Districts, 4 to 5 cents was the usual rate for the greater part of the season. The low prices in Buganda, however, caused natives to hold up their cotton to a considerable extent, and cotton was still being sold late in the year, and some growers benefited by the rise in prices in September.

Government Buying.

In certain areas in all four Districts of the Eastern Province, buyers were not able or willing to buy all the cotton offering, and it became necessary for Government to buy where private enterprise was not operating. Later on Government buying was also undertaken in Buganda and the Northern Province. This work was organised and carried out by the Department of Agriculture with its existing staff, ginning and baling being done by the different ginning firms. The total purchases amounted to the equivalent of 3,947 bales, and the effect of Government intervention was beneficial, and had an encouraging effect on the industry. A considerable profit is anticipated from the transaction.

Quality of the Cotton.

The quality of the season's cotton was generally good throughout, but owing to the limited competition and low prices some firms were only buying first quality, and the stained or dirty cotton was neglected. This is an unfortunate policy, as the native grower has been trained to separate his grades, and when he finds that only the clean cotton is marketable the natural tendency is to put as much of the lower grades in with his better cotton as possible, thus lowering the standard.

* Cotton Ginneries.

The number of cotton ginneries now exceeds 100, and over 70 of these took out licences to gin in spite of the depression. During the year a Ginning Inspector was appointed to the staff of the Department. His duties include inspection of and advice on ginning at cotton factories, with the object of improving the condition in which the lint is exported.

Cotton Duty and Licences.

The Cotton Duty at 3 cents per pound of lint was continued and realised £89,258 9s. 4d. which goes to general revenue, and this, together with ginning and buying licences at £100 and £10 respectively, represents a very large sum in the form of direct taxation provided by the cotton industry for the Protectorate Treasury.

Destination of Uganda Cotton.

Uganda cotton mainly goes to Liverpool, but the following table giving exports to India for the last five years shews how keenly that country is interested, and how the exports India-wards are increasing:—

			lbs.	£
1917-1918	...	...	3,052,963	228,999
1918-1919	...	...	5,974,245	519,645
1919-1920	...	...	4,833,656	412,550
9 months ended 31st December, 1920	...	...	6,618,103	926,676
Year ended 31st December, 1921	..	..	19,120,790	791,867

Cotton Seed Distribution.

Distribution for cotton planting for the 1921-1922 season shewed a considerable falling off, and a largely reduced acreage was planted. The climatic conditions were also exceedingly bad, and by the end of the year it was evident that, by comparison with the previous season, the output would shew at least a 60% reduction.

The table below gives the estimated acreage and the effect of low prices is clearly evidenced in all-round reduction.

Eastern Province:—

			1920	1921
Teso District	...	...	65,000	47,000
Busoga „	...	...	45,000	31,000
Bukedi „	..	...	44,000	30,000
Lango „	...	...	26,500	20,300
		TOTAL	<u>180,500</u>	<u>128,300</u>

Buganda Province:—

Mengo District	...	...	32,000	24,000
Entebbe „	...	...	10,000	6,000
Mubendi „	...	...	6,000	3,000
Masaka „	...	...	7,000	1,000
		TOTAL	<u>55,000</u>	<u>34,000</u>

Northern Province:—

Bunyoro District	...	...	1,000	500
Gulu „	...	...	1,500	1,100
Chua „	...	...	500	100
West Nile „	...	...	100	?
		TOTAL	<u>3,100</u>	<u>1,700</u>

GRAND TOTAL	...	<u>238,600</u>	<u>164,000</u>
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The crop is grown by thousands of native peasants, and European and Asiatic cultivation of cotton is negligible.

The delay in selling the previous crop and bad weather which led to late planting, and the failure of the autumn rains brought about one of the worst crops since the industry was started. With better prices, however, and a small crop leading to keen competition, there is little doubt that 1922 planting will not only be early—given reasonable weather conditions—but shew a great increase again in acreage.

Cotton Seed Selection Stations.

Serere.—Buildings at Serere in the Teso District were not completed at the end of the year. The report on the station is enclosed.

Bukalasa.—A start was made by the Public Works Department with the buildings at Bukalasa in Mengo District in October, and the report is enclosed.

Siroko Valley Development.

Three Austin tractors and ploughing equipment were presented to Uganda during the year by the Empire Cotton Growing Committee, and these have been used to plough up an area in the Siroko valley north of Mbale in Bukedi District with the object of getting the natives from the hills to come down and take up land for cotton growing. The services of an Engineer were engaged in working the machines and a good start was made.

Coffee.

This crop is grown mainly by Europeans, and the exports for the year amounted to 48,856 cwts., valued at £94,038, the bulk of which was European production. Natives grow considerable quantities, but, as yet, cannot be said to cultivate coffee seriously. Early in January the Coffee Expert arrived and spent the time, until his departure in November, in visiting the several coffee areas and numerous estates. Uganda coffee when well prepared is in demand on the home markets, and realises good prices, but the industry was handicapped by the change of currency, and, owing to the general depression, many estates were closed down.

Investigations were made during the year to trace the cause of "grassiness" which had been reported from home in a few consignments of Uganda coffee, but, so far, no definite results have been obtained.

The report of the Coffee Expert has been issued as a Departmental Circular.

Native-Grown Coffee.

Coffee growing in the Bugishu hills in Bukedi was started some years ago, but natives had difficulty in marketing their product. This year the crop was bought and shipped by the Government through the Department, and a scheme has been devised for organising the industry on a better footing, by the proposed establishment of central pulping stations to ensure the proper preparation of the coffee for market.

Rubber.

Rubber exports have declined. The fall in the price of rubber has checked any development in this direction. The Rubber Expert arrived in January and spent three months in visiting Para estates. His report has been published as a Departmental Circular.

Cacao.

This crop now receives hardly any attention, and its future in Uganda is problematical.

Sugar.

The acreage is steadily extending and stocks of cane increasing. Details of experimental work on this crop will be found in the report of the Kampala Plantation. A bulletin was also published during the year. Considerable quantities of unrefined sugar are now made in the country, and there are indications that, when things revert to a more normal condition, development with this crop will be rapid.

Oil Seeds.

There is scope for great increase in production of simsim and ground-nuts, but during the year the market for these has been poor. Reduced railway freights have improved the situation and efforts will be made to increase production of these valuable crops.

Chillies.

This crop is grown mainly in Busoga, where it is semi-wild. The prices rose during the year and a great fillip has been given, and its cultivation is extending in other districts. Exports in 1921 amounted to 7,355 cwts., valued at £30,213.

Wheat.

A small experimental station at 4,980 feet was started on the Butorogo hills in Mubendi District. Wheat does well in this part, and has been grown by natives for some years, and the establishment of a station where attention can be given to cultural experiments and trial of varieties should be a great help.

Ploughing.

Ploughing instruction under the supervision of an European Instructor has been carried on in the Eastern Province during the year, and steady progress made. Unfortunately the lack of money on account of the poor cotton crop limited the buying capacity of the native, otherwise demands for ploughs would have been much greater. Disease amongst cattle was also a handicap.

Ploughing schools for training of boys and oxen were opened at several places in Teso and Lango Districts.

Agricultural Education.

Facilities are badly needed for training natives in agriculture, and it is hoped that when the Technical School is ready, real progress in this direction will become possible.

Miscellaneous Crops.

Rice, maize, tea and tobacco are all capable of development. Rice is grown fairly extensively in Bukedi District, and also in Buganda, and may prove to be the main crop in the re-opened Sese Islands.

Miscellaneous Products.

Experiments are being undertaken at home with elephant grass with a view to its use in connection with power alcohol.

Government Plantations.

The reports on these are attached and full details of the work carried on will be found therein.

Mycological.

The Mycologist's report and his report on investigation on rice disease are enclosed.

Entomological.

The Entomologist's report gives particulars of the various pests found on crops in Uganda and is enclosed.

Imperial Institute and Kew.

Thanks are due to the Directors of the above for their reports on various plants and products sent from Uganda.

Plant Pests Board.

Meetings were held at intervals during the year, but no need arose to take any special action.

Agricultural Statistics.

Figures under this head are only approximate, and it is hoped to obtain more reliable returns from at least some of the districts in the near future.

L. HEWETT,
Acting Director of Agriculture.

ANNUAL REPORT

ON THE

GOVERNMENT PLANTATION, KAMPALA.

I remained in charge of the Plantation throughout the year. Until Mr. Small returned from leave on the 28th March, I was also acting Botanist.

Labour.

With the exception of the early part of the year, the supply of labour was satisfactory. Most of it was voluntary, and the last few months of the year it was entirely so. Wages were higher than the previous year, being florins 6/- for ordinary unskilled labour. In February an attempt was made to reduce wages, but was followed by such a falling off in voluntary labour that it was necessary to revert once more to Fls. 6/-. In spite of higher wages the work output per man has been lower, owing to the men arriving later in the morning, and showing a tendency to slack. It has been difficult to check this owing to the plantation being in Kampala township, and any undue pressure results in labour going elsewhere.

Meteorology.

The rainfall was again below the average, though the number of days on which rain was recorded was higher than usual. The weather was very unfavourable for planting, as the rains were broken by intervals of very hot and sunny weather, and there was no month which could be said to be wet and showery throughout. On the other hand, there was quite a number of severe storms which did much damage, the worst being on the 16th July, when 2.38 inches of rain were recorded, the greater part of it falling in about two hours, and which was accompanied by severe hail.

Comparative records of the rainfall for the last six years are given below, together with the monthly average shade temperatures for the year under review :—

RAINFALL : COMPARATIVE RECORDS FOR SIX YEARS.

MONTHS.	1916		1917		1918		1919		1920		1921	
	No. of days	Inches	No. of days	Inches	No. of days	Inches	No. of days	Inches	No. of days	Inches	No. of days	Inches.
January ...	10	.81	13	3.54	8	1.37	2	.05	6	3.23	9	2.19
February ...	11	4.90	17	6.14	4	.56	12	8.97	6	.65	14	1.68
March ...	15	4.40	7	4.18	11	1.97	12	8.18	15	4.38	14	2.99
April ...	15	4.68	19	8.63	19	5.41	20	5.16	17	4.74	18	5.63
May ...	17	4.81	18	8.10	13	4.93	14	3.29	21	5.48	24	2.97
June ...	17	3.22	12	4.46	11	3.29	6	1.79	14	3.24	13	2.57
July ...	5	.87	3	.23	4	.89	10	1.86	15	4.69	15	4.05
August ...	15	2.58	14	4.29	12	4.55	11	3.54	10	2.92	21	2.30
September ...	16	9.46	16	8.58	10	3.47	15	6.64	11	4.45	15	1.74
October ...	15	4.60	12	5.33	14	2.64	15	3.45	18	3.50	17	7.25
November ...	12	3.13	4	1.60	12	1.50	16	5.04	20	5.58	17	8.00
December ...	10	5.42	6	.52	7	1.79	13	2.76	15	3.39	9	2.26
TOTAL ...	158	48.88	141	55.60	125	32.37	146	50.23	168	46.35	186	43.63

MONTHLY AVERAGE SHADE TEMPERATURE, 1921.

MONTHS.	7 A.M.		2 P.M.		Maximum Temperature	Minimum Temperature	Highest Maximum Temperature	Lowest Minimum Temperature
	Dry Bulb	Wet Bulb	Dry Bulb	Wet Bulb				
January	65.38	64.45	84.03	77.03	86.61	63.41	92	62
February	65.85	64.85	82.03	76.89	84.92	64.00	90	62
March	66.83	65.83	82.58	77.25	85.29	64.96	91	62
April	66.80	66.36	80.36	75.33	83.46	65.23	87	62
May	66.16	65.06	77.90	74.09	80.58	64.22	85	63
June	64.86	63.80	77.73	73.70	79.46	62.96	83	61
July	63.64	63.51	75.41	72.16	77.51	61.41	81	60
August	63.35	62.96	74.80	72.38	78.48	61.90	84	60
September	64.50	63.43	80.43	75.13	83.30	62.43	92	60
October	64.64	63.16	80.06	71.58	84.19	62.68	91	60
November	65.53	64.33	82.00	73.50	86.50	63.80	93	62
December	65.80	64.09	87.12	73.45	89.29	63.06	94	61

Distribution of Plants and Seeds.

The following were distributed for planting during the year:—

Name	Plants	Seeds.
Coffee, various	25	21½ lbs.
Cacao	—	2 pods
Para	50	1,000
Tea	16	3 lbs.
Sugar Cane	463 canes	—
Bananas	115 suckers	—
Fruit and Economic	931	24½ lbs. and 55 packets
Decorative	310	7 packets
Food Crops, various	—	106 lbs.

Coffea arabica.

Only routine work was carried out on the various plots. Coffee leaf disease (*Hemileia vastatrix*) was very prevalent during June, July, and August, being worse than I have previously seen it, a large number of the trees being entirely defoliated for a short period. Following this there was some loss of primaries from die-back (*Colletotrichum coffeanum*), but this was not so serious as might have been expected.

The coffee bug (*Antestia lineaticolis*) appeared on a few plots in August, and at the request of the Entomologist, the pest was allowed to take its course, but eventually the attack died out without doing much damage. The trees attacked were very “open” owing to the loss of foliage by leaf disease mentioned above, and this “open-ness” of the trees appears to have been unfavourable to the increase of the pest.

The coffee berry boring beetle (*Stephanoderes coffeae*) was also present during the greater part of the year, but the damage done by this insect is difficult to estimate owing to it not being easily noticeable.

The *Grevillea robusta* shade in Plots 11, 12 and 13, was thinned out still more. The trees in these plots are rather too close planted for shade (7' x 7') as the shade tends to make the branches spread more. The appearance of these trees compares very favourably with those unshaded, but further data as to yields is desirable before definitely deciding in favour of shade. Half an acre was planted out in September 7½' x 7½' under banana shade as an experiment, the planting distance being determined by the bananas which were already planted.

The yields for the year are below normal, and I understand this has been the case in most parts of the country. In comparing the records of the yields, which are given below, with those of other parts, allowance should be made for the fact that the trees are growing in rather poor stony soil on a steep slope. The column headed “Yearly average for period” gives the average per acre per year for the whole period for which records are available. Where no records are available for any one year, that year is not included. The crop failed in 1917-18 owing to a severe attack of “coffee bug,” and in 1919-20 a large number of trees were stumped or “parrot-sticked” after a severe drought. The half acre of the Bourbon

variety, planted in April, 1916, did better this year, yielding 390 lbs. The average for this plot for the 3½ years for which records are available is approximately 200 lbs. of "parchment" coffee, or 400 lbs. per acre.

Coffea arabica, Nyasaland variety.

No. of Plot.	Area in acres	Average Yield of "Parchment" Coffee per acre.									REMARKS.
		Previous Records.							Present Record	Yearly average for period.	
		1914-15	1915-16	1916-17	1917-18	1918-19	1919-20	9 months 1920			
		lbs	lbs	lbs	lbs	lbs	lbs	lbs	lbs	lbs	
1	·85	363	300	819	20	504	121	351	137	337	Manured Basic Slag and cow manure 1913. Manured Egyptian Phosphates 1915. All irregular trees stumped 1917 and 1919.
2	1·46	82	130	598	59	204	70	403	124	215	60% of trees stumped 1915. All irregular trees stumped 1917.
3	1·50	91	176	445	6	445	98	317	112	218	All irregular trees stumped 1917.
4	1·00	231	730	94	nil	264	114	151	224	233	Manured cotton seed, 2½ lbs. per tree, 1914. Manured liquid cow manure 1915. Mulched lemon grass and stumped to 3 feet 1916. Severely pruned March, 1919.
5	·45	212	437	762	nil	195	181	201	229	286	All irregular trees stumped 1917.
6	·44	365	852	792	nil	202	nil	528	145	372	Manured Basic Slag 1913. Severely pruned 1915. All irregular trees stumped 1917. "Parrot stuck" January, 1919.
7	·70	397	1,167	675	nil	112	nil	409	201	381	Severely pruned, 1915. All irregular trees stumped. 1917. "Parrot stuck" January, 1919.
8	1·00	no record	560½	1,323	nil	no record	nil	134½	181	382	"Parrot-sticked" January, 1919.
9	·70	do	592	765	nil	do	nil	502	142	347	Mulched with lemon grass 1915. "Parrot-sticked" January, 1919.
10	·75	do	no record	949	nil	do	nil	218	58	257	"Parrot-sticked" January, 1919.
11	·75	do	do	733	nil	do	nil	319	149	252	Shaded with Grevillea robusta, "Parrot-sticked" January, 1919.
12	·45	do	do	844	nil	do	nil	486	100	301	Shaded with Grevillea robusta, Mulched with Elephant Grass 1915.
13	·70	do	do	517	nil	do	nil	347	48	192	Shaded with Grevillea robusta, Manured Egyptian Phosphates 1915.

Plots 1—3 planted April—May, 1911, 6' x 8'
 " 4—5 " May, 1912, 8' x 8'
 " 6—9 " August, 1912, 7' x 7' triangular
 " 10—13 " March, 1913, do

Coffea robusta.

The coffee leaf disease was responsible for quite a lot of damage to some varieties during the year, though they did not suffer quite so much as *C. arabica*. Some of the varieties are much more resistant to the disease than others. The most resistant types are the Toro variety; Quilou; and three trees of *C. congensis* var. *Charlottii*. Some of the other varieties are of little worth and all which are susceptible to the disease might well be cut out.

Plot No. 2 of the old trees, the seed for which was procured from near Kampala, has been cut out as it was an undersirable and unprofitable variety, very susceptible to the disease.

Half an acre has been planted with plants raised from the Toro variety 10' x 7½' under banana shade for comparison with the half acre planted with *C. arabica*.

Some of the earliest plots of the progeny of the Toro variety have borne good crops this year, and picking was still proceeding in January. It is noticeable that *C. robusta* often ripens its crop here in December and January. Records of the yields are being kept, but they are not yet of sufficient interest for insertion here. A few samples have been sent to the Imperial Institute for report.

The price obtained for the last consignment of *C. robusta* sent home, which was marketed in Liverpool during 1921, was rather low, namely £47 10s. per ton as compared with £64 obtained for *C. arabica* marketed at Marseilles about the same time. After deducting cleaning and forwarding charges, etc., and allowing for loss in weight in cleaning, this gives the local value of "parchment" coffee as approximately £23 per ton for *C. robusta* and £36 per ton for *C. arabica*. As will be seen from the table of yields given below, *C. robusta* has given much higher yields than *C. arabica*, but, owing to the lower price (though prices vary somewhat according to the requirements of the market) it would be inadvisable to recommend the planting of *C. robusta* instead of *C. arabica* until a better quality of *C. robusta* has been obtained and more data as to yields, etc., are available.

COFFEA ROBUSTA.

No. of Plot.	Origin.	No. of Trees.	Area.	Date Planted.	Distance Apart.	AVERAGE YIELD OF PARCHMENT COFFEE.													
						PER TREE.							PER ACRE.						
						1916-17	1917-18	1918-19	1919-20	9 months 1920	Present record	Yearly average for period	1916-17	1917-18	1918-19	1919-20	9 months 1920	Present record	Yearly average for period
1	Toro or Congo...	190*	62	March, 1914	12 x 12'	lbs. 2'00	lbs. 4'5	lbs. '85	lbs. 1'10	lbs. 1'65	lbs. 1'24	lbs. 1'89	lbs. 604	lbs. 1,359	lbs. 258	lbs. 333	lbs. 505	lbs. 581	lbs. 598
2	Bwamba Forest...	160	50	May, 1915	do	—	1'92	'31	'25	1'19	2'42	1'21	—	614	102	81	382	775	411

* 172 Trees from August, 1921.

Coffea excelsa.

All three varieties of this coffee continue to remain very resistant to leaf disease, indeed its effects on the trees so far have been practically nil. A few trees after bearing a heavy crop lost a few primaries from die-back, but the damage was small and due largely to the trees ripening their crop during dry weather. The trees in Plot 1 have been topped at a height of 10 feet, and those in Plots 2 and 3, which are not so strong growing, at 8 feet, thus ladders are necessary for picking the fruit from the top branches. A few of the secondaries have been thinned out this year, but they do not require a lot of pruning.

Another half acre was planted out 10' x 10' in October as the first plots are planted rather too far apart. Attention should be drawn to the very high yield of the trees in Plot 1, which is shown in the table of yields which follows, an average of over 6½ lbs. of parchment coffee per tree being obtained. Another important point is the high price obtained for the last consignment of this coffee sent home and marketed at Liverpool at the same time as the *C. robusta* previously mentioned, the price obtained being £65 per ton. Providing these prices and the recent high yields can be maintained this variety of *C. excelsa* would seem well worthy of attention, in spite of the rather long wait before profitable yields are obtained (about five or six years from planting). A hybrid between this species and *C. arabica* would seem likely to produce good results.

COFFEA EXCELSA.

No. of Plot.	Variety.	No. of Trees	Area.	Date Planted.	Distance Apart.	AVERAGE YIELD OF PARCHMENT COFFEE.									
						PER TREE.					PER ACRE.				
						1918-19	1919-20	9 months 1920	Present record.	Yearly average for period.	1918-19	1919-20	9 months 1920	Present record.	Yearly average for period.
1	Culture No. 2	195*	1	Sept. 1915	15' x 15'	'46	'11	'34	6'81	1'93	90	22	68	1328½	401
2	Plyendel	1	120	do	do	'21	'22	'78	1'77	'74	42	44	152	342	154
3	Plyendel	2	65	do	do	'06	'35	'50	2'09	'75	12	70	98	412	157

*180 Trees from August, 1921.

Coffea liberica.

This species is also very resistant to leaf disease, but so far it has not proved itself so strong growing or as good a cropper as *C. excelsa*. 22 lbs. of parchment coffee were obtained during the year from the 40 trees which were planted in March, 1916, making a total of 41 lbs. so far obtained. A sample of this coffee together with two of *C. excelsa* for comparison, have been sent to the Imperial Institute for report.

Para Rubber.

During the year a change was made in the series of tapping experiments which were commenced in 1917. On the advice of the Rubber Expert, from the beginning of July the yields from the different series were no longer kept separate, as the Expert considered that the figures obtained were of little value owing to such uncertain factors as the difference in individual tappers, the changing of tappers, and the difficulty of supervision. He considered it would be better to

carry out experiments with a view to finding out which method was least conducive to "brown bast" disease. Accordingly, though the trees were still tapped on the same systems as previously, the rubber from the different series was combined from the 1st July.

All the trees were rested for two months, in January and December, so that the tapping period was for ten months, during five of which the yields were combined. In the table of tapping experiments which follows, I have endeavoured to show the results obtained to the end of 1921, but in the case of the number of tappings, and the yields of dry rubber, the results of the individual series are only shown to the end of June, while the combined figures, which are given in the last column, are to the end of November.

It will be seen that the yield of dry rubber for the year has been approximately 2 lbs. per tree, which, though rather more than last year, has not increased so much as might have been expected, especially as the period of tapping was one month longer, but the adverse weather conditions may have had some influence on this. It will be noted that the single cut on half surface on alternate days has given by far the best results, in some series yielding more rubber than the series tapped daily. The average yield of dry rubber per tree for all the series is approximately 6 lbs. for the $4\frac{1}{2}$ years, which is low, but the trees have not been severely tapped, and this probably accounts for the low percentage of trees affected with "brown bast." Another factor tending to reduce the yield of the trees for the present year is the "leaf mildew," caused by an *Oidium* sp., which has been prevalent throughout the year, causing a serious loss of young foliage. (See Table, p. 15.)

There has been little improvement in the number of tappings obtained per inch, being $16\frac{1}{2}$ as compared with $15\frac{1}{2}$ for the previous year, but the number of trees not yielding has been smaller than usual.

"Black Thread" disease has not been so serious as it was the previous year, the percentage of affected trees being 18.33 as compared with 48.25. Most of the infections were again in series which were being tapped near the base. Infected parts as soon as noticed were painted with undiluted ordinary Brunolinum, and 2% Izal was used daily on the tapping cuts as a preventive. This treatment appears to have given better results than that of the previous year, but the drier weather must be taken into consideration as this has considerable influence on the disease.

In May, previous to the change in the tapping experiments, all the trees were examined for "brown bast" disease, and it was found that 28 of the trees were infected. All the trees were again examined in November, and 10 new infections were noted.

These examinations revealed one important fact, namely that while only 2.89 per cent. of the trees tapped on alternate days were infected, 18 per cent. of those tapped daily were infected. So far there is nothing to indicate that the method of tapping has any effect, or that there is any difference in tapping on $\frac{1}{4}$, $\frac{1}{2}$, or $\frac{3}{4}$ surfaces. The Mycologist advised that most of the infected trees should be left for the purpose of observation, but several of the worst trees have been cut out and two have been "stripped." It was noted that unless "stripping" is carried out at an early stage in the disease the results are unsatisfactory, as the surface of the cambium has already become badly damaged by the commencement of the formation of nodules. It was also noted that the best time for "stripping" was when the foliage was just mature. Trees which are "wintering" or which have a lot of young foliage on them cannot be "stripped" except with difficulty and probable damage to the trees.

Six new series of experiments were commenced in July, these being drawn up by the Mycologist, and also having for their object the determination of the method least conducive to "brown bast." In these series 600 trees are being tapped, all with one cut on one-third surface, but with varying intervals of rest. The records of the yields of each of these series are being kept separate, but they are not yet of sufficient interest for insertion here.

Tea.

Plot 1 produced a good crop of seeds. 3,000 were sown in the nurseries and a lot of young seedlings have been raised and many potted up, ready for planting out in March, 1922. 1,200 plants were planted in vacancies in Plots 3 and 4, but

the weather was unfavourable and a large proportion of them died. In November most of the trees in Plot 1 were cut down to make bushes for plucking, as the demand for seeds was small. This plot was manured with 1,418 lbs. of Egyptian Phosphate the same month.

The half-acre Plot 2 yielded 1,444 lbs. of green leaf, and 155 lbs. 11 ozs. of prepared tea as compared with 153 lbs. of prepared tea in the nine months of 1920. The weather this year was drier and not so favourable for flushing. The plot was manured with 250 lbs. of Egyptian Phosphate in September. Plot 3, which is one acre in area, but as yet has few trees bearing, yielded 158 lbs. of green leaf and 21 lbs. of prepared tea. The amount of green leaf to produce 1 lb. of prepared tea was thus approximately 9 lbs. in the case of Plot 2, and 8 lbs. in the case of Plot 3. 175 lbs. 10 ozs. of prepared tea were sold. No machinery for the preparation of the tea has yet been obtained and there is nothing new to report with regard to pests and diseases, which so far have done little damage.

Cacao.

The yields of the numbered trees are again given in the accompanying table, and those of the Calabacilla variety are once more included. There is no improvement in the yields over those of last year, rather the reverse, if the longer period is taken into consideration. The average per tree is low, but this is largely due to the inclusion of a large proportion of trees which have consistently yielded below the average, the reason for this being that at the time the trees were selected it was too early to judge whether they would prove high yielders or not. On the other hand, quite a number of trees have yielded an average of 50 or more pods per year for the whole period.

As regards the un-numbered trees, it will be seen from the table of yields that there has been an increase consistent with the longer period, but there is also an unfortunate increase in the number of pods required to produce 1 lb. of dry fermented cacao. The yields of the plots in the old areas are given for the first time.

CACAO YIELDS.

THEOBROMA CACAO FORASTERO.

11½ YEARS.									NUMBERED TREES.									13 FEET x 13 FEET.								
Red Variety.									Yellow Variety.																	
No. of Tree.	Previous records.							Present Record.	Total Yield for 7½ Years.	No. of Tree.	Previous records.							Present Record.	Total Yield for 7½ years.							
	1913-14	1914-15	1915-16	1916-17	1917-18	1919-20	1920*				1913-14	1914-15	1915-16	1916-17	1917-18	1919-20	1920*									
10	8	9	16	5	10	1	17	6	72	1	12	53	44	44	25	..	6	..	184							
16	8	4	26	16	87	51	19	26	237	3	28	64	91	30	35	4	5	18	275							
21	11	17	25	61	55	3	60	31	263	9	19	10	39	46	151	32	26	48	371							
22	11	61	37	56	12	57	86	23	343	18	2	12	25	14	5	76	45	112	291							
24	9	7	58	..	..	19	..	6	99	19	3	44	36	95	131	23	63	14	409							
26	6	8	4	14	11	25	57	23	148	23	3	30	122	99	151	80	115	41	641							
27	4	12	52	41	3	7	14	13	146	25	9	17	57	5	90	3	..	..	181							
29	11	44	97	70	40	16	51	60	389	28	4	73	110	58	43	6	18	60	372							
31	9	28	46	31	26	15	21	29	205	30	9	31	13	3	5	116	46	56	279							
32	2	55	95	47	63	89	22	24	397	39	1	3	61	15	7	13	16	12	128							
35	8	26	22	7	20	127	30	5	245	45	8	87	114	67	25	13	79	97	490							
36	11	12	28	26	88	77	31	22	295	49	6	2	51	11	70	26	33	60	259							
37	4	3	36	28	32	12	4	91	210	52	11	29	34	17	20	35	19	43	208							
38	7	64	30	90	50	9	12	8	270	53	14	13	77	22	46	1	..	..	173							
40	1	27	33	37	20	3	..	30	151	54	3	12	34	5	1	3	..	..	58							
44	2	8	11	4	..	20	16	..	61	58	6	1	41	14	28	6	..	..	96							
48	7	44	53	53	65	14	69	42	347	61	4	22	44	39	52	16	1	6	184							
55	1	28	84	29	49	5	29	21	246	68	10	5	84	24	49	12	59	19	262							
56	4	3	10	48	19	..	1	1	86	70	6	22	11	6	7	4	21	37	114							
60	4	5	32	7	19	13	3	7	90	76	16	..	49	9	7	1	4	7	93							
71	5	5	74	65	102	17	81	100	449	79	3	15	19	10	13	..	1	..	61							
72	8	76	54	75	98	61	33	26	431	82	46	94	57	5	78	48	87	105	520							
74	15	22	67	33	47	20	26	30	260	..	..	..	..	..	..	..	..	..	..							
75	24	21	53	116	123	155	79	39	610	..	..	..	..	..	..	..	..	..	..							
Total	24	180	589	1043	959	1039	816	761	6050	22	223	639	1213	638	1039	518	644	735	5649							
1913-14*	7-5	..	..	..	..	..	..	..	..	10-13	..	..	..	..	..	..	..	..	..							
1914-15	..	24-54	..	..	..	..	..	..	..	..	29-04	..	..	..	..	..	..	..	..							
1915-16	..	..	43-45	..	..	..	..	..	..	..	..	55-13	..	..	..	..	..	..	..							
1916-17	..	..	..	39-95	..	..	..	..	..	..	..	..	29-00	..	..	..	..	..	..							
1917-18	..	..	..	..	43-29	..	..	..	..	..	..	..	..	47-23	..	..	..	..	..							
1919-20	..	..	..	..	..	34-00	..	..	..	..	..	..	..	..	23-54	..	..	..	..							
1920*	..	..	..	..	..	..	31-70	..	..	..	..	..	..	..	..	29-27	..	..	..							
1921	..	..	..	..	..	..	27-62	..	..	..	..	..	..	..	..	..	..	..	33-40							

* Yield for 9 months only.

NOTE:—No records for 1918-19.

THEOBROMA CACAO CALABACILLO.

RED VARIETY.										YELLOW VARIETY.									
No of Tree.	PREVIOUS RECORDS.							Present Record	Total yield for 7½ years.	No. of Tree.	PREVIOUS RECORDS.							Present Record	Total yield for 7½ years.
	1913-14	1914-15	1915-16	1916-17	1917-18	1918-20	1920*				1913-14	1914-15	1915-16	1916-17	1917-18	1918-20	1920*		
2	34	23	15	52	183	...	...	...	257	46	12	72	67	22	5	...	...	1	179
4	21	37	29	3	44	...	1	2	137	57	2	20	57	11	...	...	...	1	91
5	32	19	8	2	44	...	2	1	108	59	30	34	17	2	...	...	...	6	89
8	2	...	...	...	...	...	...	...	2	69	1	57	71	...	...	...	...	...	129
15	18	22	2	...	6	...	1	6	55	77	1	...	...	...	...	...	...	14	15
87	43	49	80	35	50	16	20	75	388	78	7	...	2	9	22	42	25	100	207
6	150	150	184	112	277	16	24	84	947	6	53	183	214	44	27	42	25	122	710
1913-14*	25									8'83									
1914-15		25										30'5							
1915-16			22'3										35'7						
1916-17				18'66										7'33					
1917-18					46										4'5				
1918-20						1'66										7			
1920*							4										4'16		
1921								14										20'33	

* Yield for 9 months only.

NOTE.—No records for 1918-19.

CACAO YIELDS.

Plot.	No. of Trees Bearing.		Average No. of Pods per Tree		Total No. of Pods.		Weight of Pods in lbs.		Weight of Dry Cacao in lbs.		Average amount of Dry Cacao per Tree in lbs.		Average No. of Pods to 1 lb. of Dry Cacao.	
	1920	1921	1920	1921	1920	1921	1920	1921	1920	1921	1920	1921	1920	1921
Old Areas	1020	1020	20'03	26'65	20,442	27,189	14,306½	19,480½	885	1,078¾	'86	1'05	23'08	25'20
Young,,	258	264	18'25	24'43	4,710	6,452	2,720	3,845¼	157	226½	'60	'85	30'00	28'48

OLD AREAS.

No. of Plot.	Variety.		Area in Acres.	No. of Bearing Trees.	Total Pods.	Average No. of Pods per Bearing Tree.	Average No. of Pods per Acre.	Remarks.
1	Mixed.	Mostly Forastero	1'00	140	3250	23'21	3250	11½ years old, planted 13' x 13', shaded Para 26' x 26' except plot 9 which is unshaded. There are many vacancies, otherwise there would be approximately 200 cacao trees per acre.
2	do	do	1'00	109	3043	27'91	3043	
3	do	do	1'30	158	3419	21'64	2630	
4	do	do	1'20	96	3278	34'14	2731	
5	do	do	1'40	96	2823	29'40	2016	
6	do	do	'75	98	3503	35'74	4666	
7	do	do	1'18	129	2443	18'93	2070	
8	do	do	'77	57	3338	58'56	4333	
9	do	do	1'67	137	2092	15'27	1313	

YOUNG AREAS.

No. of Plot.	Variety.	Date Planted.	Areas in Acres.	No. of Bearing Trees.		Total Pods.			Average No. of Pods per Bearing Tree.			Average No. of Pods per Acre.		
				1920	1921	1919-20	1920	1921	1919-20	1920	1921	1919-20	1920	1921
1	Calabacillo Red ...	Mar. 1914	1	58	65	209	1419	2264	3'60	24'46	34'83	209	1419	2264
2	Forastero Red ...	July 1914	1	44	46	189	1047	903	4'29	23'79	19'63	189	1047	903
3	do do ...	Oct. 1914	1	43	39	59	431	528	1'37	10'02	13'53	59	431	528
4	do Yellow...	Nov. 1914	'50	82	62	233	1619	2236	2'81	19'74	36'06	466	3238	4472
5	Calabacillo Yellow	Mar. 1916	1'00	5	23	—	23	118	—	1'21	5'13	—	23	118
6	Zanzibar	Mar. 1914	'60	26	29	14	166	403	—	6'38	13'89	23	276	671

No. 1. Shaded *Cesalpinia dasyrachis*, Nos. 2, 3 and 4 Rain tree, No. 5 *Cesalpinia* and *Leucaena glauca*, No. 6 *Gliricidia maculata*.

NOTE.—The period 1920 is for 6 months only.

It will be seen that the trees in Plot 8 yielded an average of 58 pods per tree, which is as much as can reasonably be expected. According to Macmillan (in *A Handbook of Tropical Gardening and Planting*) in Ceylon a crop of 50 pods per tree is considered good, and 15 average-sized pods should produce 1 lb. of dry fermented cacao. It is evident that we have trees capable of producing 50 pods but we have yet to obtain trees capable of producing 1 lb. of dry fermented cacao from 15 pods. With careful and continuous selection, however, there seems no reason why a type of cacao having the desired qualities, and adapted to the climate, should not be evolved, and though this may take time, the value of this crop, which requires no machinery for its preparation, and which for a number of years may be grown together with bananas, one of the natives' staple foods, should make it well worth the expenditure of time and money, which will be eventually repaid when a suitable variety has been established. It will be noticed that the unshaded Plot 9, has given the lowest yield of the plots in the old area and is hardly worth retaining.

As regards the young plots, there is a satisfactory increase in the yields, except in the case of Plot 2, where there was some loss of large branches from die-back disease. It is unfortunate that these plots have so many replants or vacancies, but the position is rather exposed and the trees have been difficult to establish.

Experiments with the budding of cacao have been carried out during the year with a view to the rapid production of desirable varieties. So far the experiments have not been very successful but it has been proved that "gourmandisers," or the suckers which arise from the base of the trees may be successfully budded, and the experiments are being continued in order to ascertain which is the best method. The highest percentage of successes yet obtained was 33% in August, the "patch" method being used and the buds obtained from wood from which the leaves had fallen. A lot of plants in pots have also been budded, but with little success, as the young plants do not grow sufficiently freely. It is hoped to obtain better success with young plants planted out in nursery lines.

The year has been a normal one as regards pests and diseases and no remedial measures have been carried out beyond the removal of diseased branches and pods and burning them.

Sugar Cane.

The cane crushing experiments have been carried on throughout the year, and full details of the results obtained up to the end of 1921 are given in the table which follows. Cane grown in the swamp has continued to produce sugar of poor quality, though the yield of cane is higher than that grown on upland. Until the small plots of the different varieties, which were planted in January, 1921, are mature, it will not be possible to decide which is the best cane to grow, but several have proved very satisfactory, these being No. 3 Red, B. 4596, Striped Bamboo or Striped Ribbon, Sealy's Seedling, and B. 1528. The Uba cane has given a good quality of sugar but the percentage has been low. Several acres of each of the above varieties have been planted out during the year, so that stocks will be available, if required, both for planting and for testing purposes.

As will be seen from the tables of sugar cane yields (*pp. 19 and 20*), a number of varieties have yielded at the rate of 20 tons or more per acre, while the highest yield was obtained from plant canes of B. 4596, planted in the swamp in December, 1919, which yielded at the rate of 42 tons per acre.

The plots planted in 1916 in the swamp, and in 1917 on upland, have now passed the profitable productive stage, and those in the swamp have been uprooted, and the upland plots will be uprooted as soon as the new plots come into bearing. As it takes 15 months for plant canes to reach maturity, and 12 months for ratoons, four cuttings of cane may be taken as the maximum to be obtained from upland without manure but one or two more cuttings may be expected from cane grown in the swamps where the soil is rich and well drained.

From the 5½ acres of cane in bearing 20,154 canes of the value of Fls. 558·76 were sold to natives or issued for planting, and 8,132½ lbs. of muscovado sugar manufactured and sold for Fls. 1,226·66, so that a total revenue of Fls., 1,785·42

MUSCOVADO SUGAR YIELDS.

Variety.	Where Grown.	No. of Tests.	No. of Canes.	Weight of Canes.	Juice Extracted.		Muscovado Sugar.					
					Amount.	% to weight of Cane.	Total.	% to weight of Cane.	1st Quality.	2nd Quality.	3rd Quality.	
				lbs.	lbs.		lbs.	%	lbs.	%	lbs.	%
Striped Tanna	Upland	18	819	3,600	2,064½	57.34	370	10.27	11½	3.02	118½	31.97
do	Swamp	2	82	400	246½	61.62	43	10.75	—	—	22	51.16
Black Tanna	Upland	4	252	800	444	55.50	85½	10.68	5½	6.29	80½	93.71
White Tanna	Swamp	6	199	1,300	760	58.46	135	10.38	11½	8.61	103½	7.68
Striped Ribbon	do	5	301	1,100	630	57.27	114½	10.40	41½	35.97	73½	64.03
Striped Bamboo	Mostly Upland	46	3,753	18,500	10,233½	55.31	1,819½	9.83	360½	19.80	917½	50.40
do*	Swamp	21	1,778	11,100	5,880	52.97	1,002½	9.03	202½	20.16	608½	60.69
B. 1528	do	5	316	1,000	613	61.30	108	10.80	69½	64.53	38½	35.47
Ceylon var. 3*	do	6	551	3,000	1,553	51.76	287½	9.38	25½	8.71	207½	72.15
Ceylon Light Red	do	2	64	400	232½	58.12	42½	10.62	—	—	—	—
Ceylon var. 2*	do	2	120	900	470	52.22	60	6.66	—	—	—	—
No. 3. "Red"	Upland	50	3,642	14,300	8,184	57.23	1,515½	10.59	579½	38.26	894½	58.99
do	Swamp	1	33	200	132	66.00	19	9.50	—	—	—	—
do	do	4	445	2,400	1,418	59.08	244	10.16	6½	2.66	84½	34.50
B. 4596	Mostly Upland	43	4,112	17,100	9,726½	56.87	1,721	10.06	476½	27.70	1,015½	58.98
do	Swamp	4	370	2,100	1,114	53.04	173	8.23	8½	4.91	38	21.38
do	do	8	634	3,200	1,691	52.84	290½	9.07	—	—	—	—
D. 74?	do	29	2,120	10,100	5,598½	55.42	981	9.71	60½	6.17	223	22.73
"Native"	do	3	106	600	367½	61.25	54	9.00	—	—	—	—
131 P.	do	2	86	400	203½	58.87	36½	9.12	—	—	—	—
Sealy's Seedling	do	4	207	1,200	690	57.50	116½	9.70	—	—	23	19.74
do	Upland	7	652	2,500	1,475	59.00	260½	10.42	76½	29.31	165½	63.58
No. 4. Java	Swamp	2	104	400	242	60.50	45	11.25	—	—	—	—
B. 3922	do	6	313	1,200	733	61.08	122½	10.20	—	—	—	—
Uba	do	20	2,368	5,500	2,879	52.34	484	8.80	152½	31.53	312½	64.54

* These are "plant" canes.

SUGAR CANE YIELDS.

Variety.	Where Grown.	Date Planted.	Area in Acres.	No. of Canes.		Weight of Cane.		Tons of Cane per Acre.	
				9 Months 1920	1921	9 Months 1920	1921	9 Months 1920	1921
Striped Tanna	...	March, 1916	.14	26	414	lbs. 225	lbs. 2,276	Tons. .71	Tons. 7.30
do	Upland	1917	.45	112	4,332	586	11,624	.58	11.53
White Tanna	Swamp	1916	.047	161	732	1,633	4,006	15.51	38.05
Striped Ribbon	do	1916	.018	153	259	753	842	18.67	20.88
Striped Bamboo	Mostly Upland	1917	.45	2,283	3,555	12,369	20,951	12.25	20.78
do	Swamp	1918	.34	—	2,488	—	11,872	—	15.58
do*	do	September, 1920	.63	—	3,543	—	20,085	—	14.23
do*	do	January, 1920	.12	—	890	—	5,468	—	20.34
B. 1528	do	September, 1920	.038	233	424	829	2,016	11.21	27.27
Ceylon	do	1916	.11	130	99	518	542	2.10	2.21
Ceylon var. 2.*	do	March, 1916	.034	—	309	—	2,191	—	28.76
Ceylon var. 3.*	do	May, 1918	.070	—	1,258	—	5,557	—	35.43
No. 3 "Red"	do	1916	.12	690	943	3,138	2,827	11.67	10.51
do	Upland	1917	.30	4,519	3,510	15,246	15,681	22.24	23.33
do*	Swamp	1920	.50	—	1,749	—	7,495	—	6.69
B. 4596	Mostly Upland	March, 1917	.60	3,495	5,120	17,666	22,573	13.14	16.79
do	Swamp	1916	.083	—	765	—	3,589	—	19.30
do*	do	December, 1919	.43	—	7,146	—	40,906	—	42.46
D. 74 ?	do	March, 1917	.15	271	1,986	1,109	9,723	3.30	28.93
Native	do	1916	.11	198	260	1,075	1,554	4.36	6.30
131 P.	do	1916	.088	133	95	352	451	1.78	2.28
Sealy's Seedling	do	1916	.046	477	388	2,911	2,025	28.25	19.65
do	Upland	1917	.45	1,746	1,443	20,314	4,439	20.15	4.40
Java	Swamp	1916	.06	240	445	702	1,842	5.22	13.70
B. 3922	do	1916	.055	185	598	735	2,661	5.96	21.59
Uba	do	1916	.070	330	2,155	891	5,435	12.05	34.66
TOTAL	...	...	5.504	15,382	44,906	81,052	208,631	11.09	16.92

* Cane was cut from these plots for the first time in 1921.

was obtained against which the cost of maintenance, etc., was Fls. 913.60, of which the cost of the crushing, sugar boiling and manufacture only was Fls. 320.83. Towards the end of the year there was a fall in the price of muscovado sugar, first quality now realising only 20 cents of a florin as compared with 35 at the beginning of 1921. It will be seen that the average price for the year was approximately 15 cents of a florin, but at present not more than an average of 12 cents of a florin may be expected.

During the year a small leaflet was published embodying details of the experiments carried out and giving a description of the varieties of cane grown.

The demand for cane for planting was smaller than for previous years, but this is not due to any lack of interest in the crop, but to planters having now raised stocks of their own from cane previously obtained from the plantation, or from other sources. 8,221 canes were planted in the plantation and Kampala Swamp and 463 were supplied to other sources.

The crop continues to be free from serious pests or diseases.

Fruit and Economic Plants.

Building plots having been laid out in the old economic plot, it became necessary to commence a new one-acre plot in a lower part of the plantation, and in April 30 varieties of fruit and economic plants were planted out, some of these being transplanted from the old plot and the others seedlings. Unfortunately the weather was not very favourable for planting and there was a lot of losses, particularly among plants received from the Botanic Gardens, Entebbe, the change from the Entebbe soil and conditions being apparently unsuitable. In October a few more varieties were planted out and the number again brought up to thirty, in addition to pineapples and tree tomatoes planted between the rows as catch crops. The *Phyllanthus distichus* planted out in May, 1920, fruited in December, 1921, and other trees which have fruited and provided useful seed for propagation are *Achras Sapota*, *Anacardium occidentale*, *Anona* spp., *Citrus* spp., *Chrysobalanus Icaco*, *Eriobotrya japonica*, *Mangifera indica*, *Persea gratissima*, and *Psidium Cattleianum*.

Nurseries.

These have been mainly devoted to the propagation of fruit and economic plants. In addition to such plants as coffee, cacao, and tea raised for the plantation, a large number of fruit trees has been raised for distribution. Seeds of a large number of varieties and species have been sown, among which may be mentioned 504 oil palm nuts from West Africa and 5,249 from local sources, 50 *Achras Sapota*, 338 *Anacardium occidentale*, 308 *Anona Cherimolia*, and 265 *Persea gratissima*, in addition to large numbers of *Anona muricata*, *Artocarpus integrifolia*, *Citrus* spp., *Eugenia Jambos*, etc. It is to be regretted that a *Fusarium* Wilt disease attacked the young seedlings of *Anacardium occidentale* and destroyed nearly all of them. This disease is being investigated by the Mycologist.

Experiments with the budding of *Persea gratissima* and *Eriobotrya japonica* were carried out and met with a fair amount of success, but the main object was to train natives how to bud, and an intelligent native has now been trained to do T budding and will be able to train other natives.

Miscellaneous Crops.

These include Arrowroot, Bananas, Beans, Soya Beans, Yam Beans, Buckwheat, Castor Oil, Cassava, Flax, Ground-nuts, Garden Pea, Maize, Millet, Sweet Potatoes, Rice, Wheat, etc. The majority of them have been grown as catch crops, and, with the exception of the under-mentioned, call for no special note, except that the year has not been very favourable for annual crops on the whole.

CASSAVA.

40 sets each of eight varieties were planted 4' x 4' apart in January, 1920, but one variety died. The crop from the remainder was reaped in July, 1921, the yields in lbs. being:—Bitajuma 632, Nakitembe 618, Bitamisi 566, Mukedi 334, Ruanda 311, Nakacacari 197, Nyumba Ezunga 133. Plots of each variety were planted again in July, 1921, in order to obtain further data. Samples of starch of each variety were prepared and forwarded to the Imperial Institute for report.

FLAX.

This was grown for seed only, but on each occasion sown, the weather was unfavourable and the yields poor. The seed appears to have deteriorated and fresh stocks are desirable.

WHEAT.

The results obtained from this crop were also unsatisfactory, and here again there has been deterioration in the seed. Good seed of wheat and flax cannot be kept for long without proper attention to seed selection, for which work the situation of the plantation is unsuitable, one at a higher altitude being desirable.

RICE.

In April, 1921, a plot .63 acre in area was sown with 22 lbs. of rice of the variety called "Gamuti." The situation of the plot was in the swamp at the foot of a steep slope and the area was divided by drains into six small plots. The plots were not irrigated, but there was a percolation of water through the plots from the adjoining hillside, so that there was always water within a foot of the surface, except at the top part where the ground was higher. Germination was good, but the young plants were early attacked by the rice blast, *Piricularia oryzae*, and this disease was present throughout the growing period. In spite of this a good crop was obtained except from the higher part, where most of the glumes were empty. The yield obtained was 812 lbs. of paddy rice, or 1,278 lbs. per acre, but some of the plots yielded at a higher rate than this, the highest being 1,450 lbs. per acre. As the soil and situation have proved suitable for rice, these plots are being levelled and made suitable for partial irrigation, as there is little doubt that the good results obtained were in a large measure due to the presence of a good supply of water at the roots.

Contour Drains and Catch Pits.

During the year five methods have been used in experiments for the prevention of soil erosion. These are :—(a) A system of contour drains recommended by the Rubber Expert, which consists of laying out lines of pegs along the contours at distances varying with the steepness of the slope, and digging holes 2 feet wide, 4 feet long, and 3 feet deep, at suitable intervals six inches in front of the lines of pegs, the earth taken out of the holes being used to form a low bank along the contours. These contour drains have been laid out in part of the Para. (b) A modified system of the above with smaller holes, which has been laid out in part of the coffee. (c) Shallow contour drains laid out fairly close in two of the tea plots. (d) Planting lines of lemon grass along the contours, an occasional catch pit being necessary in weak places. (e) Catch pits in every coffee square in alternate lines of coffee.

Of the above (a) is an excellent system but very expensive, costing here Fls. 53/- per acre; (b) is also good but expensive, costing Fls. 38/- per acre, but the ground was stony; (c) is a useful system among close-planted trees. The drains stop when meeting a tree, but the bank of soil is continued. The only objection is that they require rather frequent attention. The cost was Fls. 15/- per acre on black soil, and Fls. 17/- on stony soil. (d) This is a very good system where the trees are widely planted as from ten feet or more, especially where there is a large fall of leaf as among Para and Cacao. Where the trees are close-planted it is apt to interfere with the free growth of the trees where the lines run near them. The grass may be cut at intervals and mulched between the trees or dug in. The cost is Fls. 10/- per acre. (e) This is very suitable for coffee when planted not more than nine feet apart. The fact that the catch pits are only in alternate lines allows the use of planet junior hoes in the other lines where these are in use. The cost here was Fls. 10/- per acre, but would vary much according to the size of the holes. The prices are high owing to the plantation being in Kampala, and could be done for much less in country districts. They are only given to show the comparative cost of the different methods. The conservation of the soil is extremely important here where manure cannot be obtained at a reasonable cost, and it is hoped eventually to bring the whole of the plantation under one or the other of the last three methods, the cost of the two first being prohibitive.

General.

Building plots have been laid out in a large portion of the higher part of the plantation, comprising most of the area under *Coffea arabica*, the economic plot, tea plot No. 1, etc. The commencement of any comprehensive experiments in this

area is therefore useless. The cutting of the motor tractor railway through the plantation has cut off about one-third of the area and has resulted in the loss of a number of para, coffee, cacao, etc., and the records of the affected plots will accordingly require adjustment. It is to be hoped that steps will be taken to definitely reserve for the plantation the area below the motor tractor railway, as the possibility of further changes is derogatory to the carrying out of experiments likely to extend over a lengthy period.

Native Agriculture.

During the year one of the native agricultural overseers resigned and his work was taken over by one of the others. Returns of the number of trees cultivated are not all to hand, but those received indicate that while there has been some slight increase in the number of coffee trees, the number of para trees is practically stationary, while the number of cacao is less than formerly. A short tour of inspection was carried out in September, when it was found that the chief reason for the slow progress was the difficulty of disposing of the crops at a reasonable price. Prices are now somewhat better, and it is anticipated that there will be an increased interest taken in coffee, but no increase in para or cacao is expected at present.

A number of natives have attended the plantation for courses of instruction in the cultivation of various crops, but in most cases the courses have been too short to be really effective. In addition to the native previously referred to as having been trained to bud fruit trees and who has also been trained in propagation work generally, several other intelligent Baganda, able to read and write their own language, are being trained as specialists in such crops as coffee, cacao, rubber, tea, and sugar. It is hoped that these men will be helpful in training others in the cultivation of the crops they have charge of, and in order to help this work, notes on the cultivation and preparation of coffee and rubber, written in Luganda, have been prepared, and it is hoped to provide notes on the other crops as opportunity offers. For the better advancement of this work some system of apprenticeship is advisable, as at present a lot of time may be wasted by training a man who may leave after perhaps six or twelve months, just when he is beginning to acquire some useful knowledge.

J. D. SNOWDEN,

District Agricultural Officer.

ANNUAL REPORT

ON THE

GOVERNMENT PLANTATION, KAKUMIRO, MUBENDI.

Rainfall.

The rainfall throughout the year was fairly evenly distributed, and with the exception of the usual spells in January, February and December, no dry period of any length was experienced.

The highest fall registered in any one day occurred on the 4th October, when 2.23 inches were recorded.

Less hail was experienced this year, only one severe storm having occurred—on the 8th November.

The rainfall records for the past five years are given in the following table :—

MONTHS.	1917		1918		1919		1920		1921	
	No. of days	Inches	No. of days	Inches	No. of days	Inches	No. of days	Inches	No. of days	Inches
January ...	7	2'54	6	3'01	3	0'73	1	0'55	5	2'06
February ...	11	6'22	2	1'43	10	4'48	3	0'18	5	1'64
March ...	8	1'90	9	2'80	7	5'32	12	5'77	9	3'33
April ...	17	7'01	18	6'42	13	6'33	13	4'76	15	6'07
May ...	18	7'77	11	5'33	5	1'63	8	3'02	17	3'46
June ...	11	3'64	7	0'86	4	2'67	8	3'95	12	5'17
July ...	4	0'93	4	2'47	8	1'94	6	1'57	6	4'04
August ...	15	4'74	14	6'16	8	6'05	7	2'48	16	7'01
September ...	18	11'74	9	2'45	13	5'67	14	6'92	19	5'85
October ...	19	11'26	16	5'93	16	5'17	19	5'27	20	8'88
November ...	5	0'94	11	4'52	13	5'17	18	3'76	13	4'76
December ...	3	0'44	10	2'50	9	1'91	5	0'59	7	1'47
TOTAL ...	136	59'13	117	43'88	109	47'07	114	38'82	144	53'24

Labour.

There has been a plentiful supply of labour throughout the year, and it has not been necessary to apply for Kasanvu labour.

Coffee.

No additions have been made to the area under coffee, which is approximately 26½ acres, consisting of 21½ acres *C. arabica*, var. Nyasaland, 1½ acres *C. arabica*, var. Costa Rica, 1 acre *C. arabica*, var. Bourbon, and 2 acres *C. robusta* and two small plots containing *C. excelsa* and *C. eugenicides* (?), the Nandi Coffee.

C. arabica.

Owing to the bad state of the trees, Plots No. 1 (1912) and No. 11 (1911) were stumped, and the remaining plots were severely pruned, so that only a very small crop has been picked.

The trees were remarkably free from leaf disease (*Hemileia vastatrix*) until about the middle of November, when a very severe outbreak occurred. The 1907 coffee in Plot 8 suffered severely from this outbreak, a large number of the trees becoming almost entirely defoliated. Occurring, as it did, just at the period when the trees were about to flower, this attack must have a marked effect on the next season's crop.

The Variegated Bug (*Antestia orbitalis*, var. *faceta*), was very numerous early in the year and did considerable damage to the young berries, but continual picking had its effect, and from May until October this pest was apparently absent. A few were discovered again in November, and boys were at once put on picking, with the result that at the time of writing, the plantation is again apparently free from this troublesome pest.

In February, a stem boring beetle (*Apate* sp.) was found to be attacking trees in all parts of the plantation. No other material being available, an attempt was made to control this pest by means of a mixture of gas-tar and clay. No conclusions as to the usefulness of this control can be arrived at, however, as the pest disappeared suddenly, and although several trees have since been found which were not treated, no trace of the beetles has been seen, so that it is probable that the disappearance of this pest was due more to natural causes than to the control used.

Root Scale (*Pseudococcus citri*, Risso) accompanied by the White Root Disease, has been very troublesome throughout the year on the Costa Rica and Bourbon varieties of coffee planted in 1918, and efforts at controlling both the scale and the fungus have not proved very successful. The land occupied by this coffee was previously cropped with cotton, followed by leguminous crops before the coffee was planted, and it is probable that this previous cropping is partly responsible for the presence in the soil of the large number of scale insects found on the coffee roots. Control has consisted of exposing the roots and spraying with tobacco at a strength of 1 lb. of leaf to 2 gallons of water, and after spraying, the roots have been left exposed for some days. This treatment has undoubtedly been successful in destroying many of the insects, but it is, of course, impossible to get at all of the roots with the spray, and consequently many insects escape.

In the case of the root disease, the method resorted to has been to excise the diseased portions of the roots and burn them. Fresh outbreaks of this disease are continually occurring, and it is probable that coffee will never prove successful on this land without the use of lime or some other soil steriliser.

C. robusta.

The two plots of *C. robusta* have done very well and good crops have been picked from both plots.

This coffee does not suffer to the same extent as the arabica varieties from the attacks of the Variegated Bug, but appears to be more liable to the attacks of scale insects.

The crop is from a month to six weeks later in ripening. Particulars of the yields obtained from these two plots are given below :—

Date Planted.	Area.	Yield of Parchment.		
		1919	1920	1921
1916	1 acre	597 lbs.	701 lbs.	670 lbs.
1917	1 acre	—	504 „	556 „

Para Rubber.

Tapping was commenced on two series of trees in January, and was carried on regularly throughout the year.

Series I. consisted of 100 trees tapped with one cut to the left on one-third surface on alternate days.

Series II. consisted of 100 trees tapped on alternate days with two cuts to the left on one-quarter surface.

Unfortunately, owing to a change of tappers, the records of these two series became mixed.

Rubber records from Kakumiro, however, are of little general interest, as this plantation is not within what is considered the rubber producing area of the country, the climate here being much drier than in the districts nearer the lake.

Two young lads, who had expressed a wish to learn, were trained as tappers, but it is extremely difficult to impress upon the native the need for care and cleanliness. Many of the trees suffer damage each year from the heavy winds experienced, usually from the East or N. East, and several trees have had to be removed on this account.

There have been several cases of Bark Rot, but generally speaking the trees are in a satisfactory condition.

Tea.

The area under tea is still too small for any definite records of yield to be obtained for comparison with other tea-growing countries.

Regular pluckings have been taken about every ten days and 15 lbs. of prepared tea was obtained. The preparation is entirely by hand, and it is not possible to give close attention to detail that is necessary for the production of a first-class tea, but the tea produced is of very fair flavour, and free from any objectionable taint, and finds a ready sale locally.

The trees have been free from disease or pests throughout the year, but young, newly-planted trees suffer severely from the attacks of crickets, and it is found difficult to establish young trees on this account. Dustings of Paris Green have proved fairly effective against this pest.

Large quantities of seed have been produced by the unpruned trees which have been left as seed bearers, but there has been no demand for seed of this very promising crop.

Cacao.

This crop has made little progress. A few trees have produced a small crop of pods for the first time, but there seems little likelihood of cacao proving successful in its present position on the plantation.

Sugar Cane.

Sugar cane does well here and a fair quantity of cane has been cut and sold to natives as food.

During October, one stool of Striped Ribbon threw up a flowering spike. The flower developed slowly, and on the 3rd December, when the cane was cut and stolen, the flower was still only half developed. It was extremely unfortunate that this cane should have been destroyed in this way, as had seed been produced the result may have proved interesting.

Wheat.

The cultivation of wheat has not proved very successful here, although results tend to prove that with the introduction of fresh seed, say every two or three years, fairly satisfactory results may be obtained. As is usual with plants of all descriptions, continual growing under adverse conditions gradually weakens the strain, and in the case of the varieties of wheat grown here, any rust-resisting powers which these varieties possessed have apparently been lost, owing to continual growing under conditions which favour the attacks of the rust fungus.

The varieties grown were Pusa Nos. 4, 6, 11, 12, and 13. The first four have been grown here for some years. No. 13 was grown from seed sent out in March. Two sowings were made, the first in March and the second in August. The plants from the March sowing were attacked by Black Rust, due to *Puccinia graminis*, early in May, the outbreak being practically simultaneous on each variety.

Reaping took place on 17th June, and the results obtained showed a return per acre as follows:—No. 4, 205 lbs.; No. 6, 130 lbs.; No. 11, 194 lbs.; No. 12, 220 lbs.; No. 13, 575 lbs.

The August sowing was attacked by rust during September. The attack was severe, until, at the middle of November and before the grain had fully developed, the straw appeared to ripen off suddenly and assumed a dirty yellowish appearance, which, from a distance, gave it the appearance of being fully ripe.

Reaping took place on 28th November. No. 13 did best all through, and although badly rusted, withstood the attack better than the other varieties, and yielded a fair sized grain. The yield from this variety equalled 515 lbs. per acre. The yield obtained from the other varieties was negligible.

Cotton.

Cotton was sown during the first week in July. The seed germinated excellently, and a good stand of young plants was obtained. Some damage was done by crickets, and a hailstorm on the 8th November caused a good deal of harm. The hot, dry weather in December commenced rather too early for this crop, before the plants had recovered from the effects of the hail, and only a medium crop is anticipated. A slight attack of the grey mildew (*Ramularia areola*, *Atk.*) occurred during November, the damage, however, was slight, and the disease disappeared when the drier weather set in.

Native Silkworm Trees (*Bridelia Micrantha*, var. *Ferruginea*).

No progress has been made with the domestication of the African Silkworm (*Anaphe sp.*). Early in the year alternate trees were pruned down to four feet, leaving the remaining trees to provide the shade which the insects seem to require. The pruned trees all grew strongly, and provided an abundance of fresh young growths, and there appeared every likelihood of new colonies of insects being induced to settle amongst the trees and so obviate the necessity for artificial stocking. During May large numbers of caterpillars were observed on the trees and there appeared to be every prospect of a good number of nests being formed, but an examination of the trees showed that only one new nest had been completed and there were no traces of any remaining caterpillars. It was not possible to keep the caterpillars under observation, so that it is not possible to say whether the failure to form nests was due to the attacks of birds or to parasitic enemies.

Fruits.

The following additions have been made to the fruit collection:—Strawberries, *Aberia caffra* (Kei Apple), *A. Gardneri*, *Psidium Araca*, *P. pumelum*, and *Rubus phoenicolasins* (the Wineberry.)

Several of the young citrus and mangoes were attacked by scale during October, but these were successfully dealt with by using Whale Oil Soap at a strength of 1 lb. of soap to two gallons of warm water.

The grape vines have made no progress and are not a success here.

The figs continue to form small fruits, which, however, drop off before they reach maturity. This is probably due to the lack of lime in the soil.

Rhubarb is successful here if kept shaded and well watered.

Vegetables.

Small plots of onions (Large Red and Silverskins), beetroot, pumpkins, vegetable marrow, and egg-plants were sown for seed purposes.

Both varieties of onions germinated well, but although a large number of the plants have flowered, no seed has yet been produced.

Beetroot germinated poorly and the few plants produced were destroyed by the weeders.

Both pumpkins and the vegetable marrows did well, and a quantity of seed was obtained.

The egg plants failed to germinate.

Rice.

Rice was almost an entire failure owing to the bad attack of a scab disease, the cause of which is at present undetermined. Five small rice beds were constructed on the borders of the swamp near the nursery and by means of dams it was found possible to irrigate the beds to a depth of about five inches with running water. The failure of this crop was very disappointing, as the natives were becoming interested in it and there are many localities in the district where this crop might be grown.

Maize.

Two varieties of maize (Hickory King and Yellow Hogan) were sown in March and good crops were obtained. Another sowing was made in September, but owing to an outbreak of downy mildew, due to a species of *Sclerospora*, a very poor crop was obtained. This disease caused a good deal of loss amongst the native-grown maize.

“Bulo” (Small Millet).

One-eighth of an acre sown with “bulo” yielded 150 lbs. Some damage was done to this crop by a disease causing the non-maturing and the drying-up of the heads, the cause of which is at present under investigation.

“Mweri” (Bulrush Millet).

This millet, which is said to be a good drought resister was introduced from the Chua District. So far it has proved to be rather too slow in growth to become very popular amongst the natives of this district, but it is hoped that it may prove a valuable addition to the food crops in the southern part of the district where drought sometimes causes a shortage of food.

Other Crops.

Small plots of simsim, groundnuts, buckwheat, haricot beans, native beans and twelve varieties of sweet potatoes were grown, and all gave satisfactory yields.

Miscellaneous.

A consignment of three varieties of *Cinchona* (Quinine) seed were received in February, *Cinchona robusta*, *C. succirubra* and *C. ledgeri-ianana*, *C. succirubra* hybrids. This seed does not retain its germinating powers for any length of time, although the seed was sown immediately on its arrival here, the whole of it failed to germinate. Other interesting and useful introductions have included: *Pinus Canariensis*, *Juniperus Codrew*, *Albizzia Lebbek*, *Momordica cochinchinensis*, *Erithrina corralodendron*, *Cassia leiantha*, *C. Grandis*, *Psidium Friedrichsthalianum* and *Chrysophyllum cainito*.

Distribution of Plants and Seeds.

The following plants and seeds were distributed during the year, chiefly to natives in the district :—

<i>Plants.</i>			<i>Seeds.</i>	
Fruit Trees		223	Fruit	... 9 packets
Decorative and Shade Trees		179	Chillies	... 3 lbs.
Chillie Plants	...	100	Trees	... 6 packets
			Maize	... 15 lbs.
			Wheat	... 10 "
			Rice	... 5 "
			Simsim	... 1 lb.

In addition to the above, practically the whole of the cotton seed for this season's crop for the counties of Bwekula, Bugangadzi and Buyaga, amounting to 7,710 lbs., was distributed from the plantation.

Native Agriculture.

Several tours were made in different parts of the district, and a good deal of time was taken up with the purchase of part of the cotton crop by Government at Mubendi and in Buyaga.

Native agriculture in the district has received a severe set-back owing to the lack of buyers and low prices prevailing. Excepting in the Mityana area, and that part of the district lying within reach of Kampala, cotton has been the only marketable crop.

The action of Government in commencing to buy in outlying parts undoubtedly encouraged other buyers to operate, but owing to the difficulty experienced in transporting the cotton after it had been purchased, a large proportion of the crop still remained unsold at the end of the year.

Nine native agricultural instructors were at work in the district throughout the year.

G. T. PHILPOTT,

Assistant District Agricultural Officer.

ANNUAL REPORT

ON THE

EXPERIMENTAL WHEAT STATION, BUTOROGO, MUBENDI.

The area selected for this station consists of five acres situated near the Gombolola Court at Buganyi, approximately thirty miles N. East from Mubendi and ten miles East from Kakumiro, at an altitude of 4,980 feet.

Work was commenced on the selected area in August, and up to the end of the year consisted of clearing and planting with leguminous crops.

Wheat was introduced to the natives on the Butorogo hills in 1916, and has been grown by them with some amount of success. The object of this station is to select improved varieties, suitable for the locality, and to give demonstration in methods of cultivation and rotation. It is proposed to have one-third of the station under wheat yearly, and to introduce a three years system of rotation.

G. T. PHILPOTT,

Assistant District Agricultural Officer.

ANNUAL REPORT

ON THE

GOVERNMENT PLANTATION, FORT PORTAL, TORO.

The plantation was under the charge of Capt. Harmsworth, M.C., Assistant District Agricultural Officer, until October 15th, when he was transferred to the Eastern Province. From that date onwards I was in charge, but I was unable to visit the plantation again before the end of the year.

Area.

No addition was made during the year to the area under cultivation, which is approximately 12 acres, consisting of $5\frac{1}{2}$ acres coffee, 1 acre tea, $\frac{1}{2}$ acre devoted to fruit, the remainder being occupied by nurseries or used for the cultivation of miscellaneous crops.

Weather.

The weather throughout the year was favourable for the growth of the crops. The rainfall was fairly evenly distributed, and no dry period of any length was experienced. Rainfall records are not kept.

Coffee.

Of the area under coffee, 3 acres were planted in 1915, 2 acres in 1916, and $\frac{1}{2}$ acre in 1917, the whole being of the Nyasaland variety; separate returns of yields obtained from the trees planted in different years have not been kept. The total crop picked this year amounted to 6,839 lbs. of parchment, showing an average return of just over half a ton per acre. The trees were free from disease or pests throughout the year.

Tea.

The trees planted in 1915, and kept as seed bearers, have produced large crops of seeds, for which, however, there is at present no demand. The younger trees, planted in 1918, were pruned down in October, and it is intended to commence plucking in the new year.

Wheat.

Two one-acre plots were sown in April, the varieties being Pusa No. 20, and a variety obtained locally which has been grown by the natives for some years. The sowings were made at the rate of 40 lbs. of seed to the acre. Reaping took place in July, the yields obtained being 191 lbs. and 125 lbs. respectively. A second sowing was made in September, when 2 acres were sown with No. 20, and $\frac{1}{2}$ acre with the local variety. The crop was reaped at the end of December, and gave a return of 620 lbs. and 96 lbs., showing an average of 310 and 384 lbs. per acre. No trace of the rust diseases were observed on either sowing.

Fruit.

The fruits grown on the plantation include orange, lemon, guavas, mulberries, tree tomato, papaw, raspberries, strawberries, figs, mango, and loquat: all have fruited. Rhubarb has proved successful but needs careful attention.

Shade Trees.

Leucæna glauca has been tried as shade for coffee but has not proved successful, being slow in growth.

Maize.

Ten lbs. of Hickory King sown in April gave a return of 388 lbs., and 3 lbs. of Yellow Hogan sown at the same time yielded 71 lbs. Another sowing of both varieties in September gave a good crop, which found a good demand amongst the natives for food purposes, and most of which was sold in the green state.

Sugar Cane.

Sugar cane is grown on the lower, swampy part of the plantation. No useful information with regard to this crop is obtainable, however, as the cane is simply cut for sale to the natives for food.

Miscellaneous Crops.

Plots of beans, soya beans (4 varieties), buckwheat, and "bulo" all gave satisfactory crops. The produce is either sold locally for food or distributed amongst the natives of the district for seed purposes.

Useful and Ornamental Trees.

A number of different kinds of trees were raised in the nursery and distributed in the district during the year. Amongst new introductions are *Pinus canariensis* and *Cedrella Toona*, both of which appear to be successful here.

G. T. PHILPOTT,

Assistant District Agricultural Officer.

ANNUAL REPORT ON THE SEED FARMS IN TESO DISTRICT.

Meteorological Report.

The following table gives a summary of the rainfall and temperatures taken at Serere and Simsa Farms during the past year:—

RAINFALL.			SERERE.		TEMPERATURES.			
Month.			Rainy days.	Inches.	Average Maximum.	Average Minimum.	Highest Recorded.	Lowest Recorded.
January	...	...	4	0.68	91.3	66.0	95	63
February	...	...	6	1.60	92.2	67.0	96	62
March	...	...	4	0.72	94.8	67.3	101	65
April	...	...	8	4.32	92.9	67.3	103	64
May	...	...	13	5.88	89.3	66.3	97	63
June	...	...	11	5.99	87.2	64.5	95	62
July	...	...	14	9.56	82.7	63.2	90	60
August	...	...	7	2.61	85.5	63.2	89	61
September	...	...	11	5.01	87.5	63.6	93	60
October	..	...	13	4.63	89.5	61.1	94	59
November	...	...	7	1.54	89.0	63.0	93	60
December	...	...	3	0.46	90.1	69.6	94	62
TOTAL ...			101	43.00	—	—	—	—

RAINFALL.			SIMSA.		TEMPERATURES.			
Month.			Rainy days.	Inches.	Average Maximum.	Average Minimum.	Highest Recorded.	Lowest Recorded.
January	...	...	1	0.40	95.5	63.3	101	58
February	...	...	7	1.32	93.8	66.2	101	62
March	...	...	5	1.42	96.5	67.5	102	64
April	...	...	8	2.62	95.3	67.3	103	65
May	...	...	14	5.90	88.4	66.0	95	64
June	...	...	16	4.81	85.3	65.3	91	62
July	...	...	13	8.00	82.2	63.8	88	61
August	...	...	13	5.15	86.0	64.4	90	61
September	...	...	12	5.16	90.2	63.4	96	61
October	...	...	17	5.25	90.6	64.0	96	62
November	...	...	9	1.82	93.1	64.3	99	58
December	...	...	2	0.42	97.0	60.9	101	56
TOTAL ...			117	42.27	—	—	—	—

Crop of Year 1920.

The following particulars summarise the results obtained from the previous year's cotton crops which could not be included in the last annual report:—

Simsa Farm. Cotton Crop Results.

Var. Nyasaland No. 32.—Area 11 acres; yield 4,449 lbs.=404½ lbs. per acre.

Ginning Test.—Weight of Seed Cotton delivered to opener, 3,233 lbs.:—

		lbs.	Per cent.
Total lint from gins	...	1,021	31·581
Cotton Seed	...	2,167	67·025
Dust immature cotton	...	26	·806
Grit from openers	...	19	·588
TOTAL	...	3,233	100·000

General Remarks During Ginning.—Some slight stain and leaf throughout the sample. Length of staple average 1⅜ inch, lint strong and lustrous.

Var. Allen No. 14.—Area 4 acres; yield 1,782 lbs.=445½ lbs. per acre.

Ginning Test.—Weight of Seed Cotton delivered to opener, 1,253 lbs.:—

		lbs.	Per cent.
Total lint from gins	...	377	30·009
Cotton Seed	...	852	67·977
Grit from opener	...	8	·638
Dust, etc.	...	16	1·376
TOTAL	...	1,253	100·000

General Remarks.—Some slight stain. Lint soft fine and lustrous. * Length of staple average 1½ inch and fair strength.

Var. Sunflower No. 7.—Area 2 acres; yield 917 lbs.=458½ lbs. per acre.

Ginning Test.—Weight of Seed Cotton delivered to opener, 646½ lbs.:—

		lbs.	Per cent.
Total lint from gins	...	193·25	29·89
Cotton Seed	...	449·75	69·54
Dust, Grit, etc.	...	3·50	·57
		646·50	100·00

General Remarks.—Somewhat stained and leafy. Lint soft and lustrous. Length of staple average 1⅜ inch and good strength.

Var. Nyasaland No. 21.—Area 2 acres; yield 725 lbs.=362½ lbs. per acre.

Ginning Test.—Weight of Seed Cotton delivered to opener, 550·25 lbs.:—

		lbs.	Per cent.
Net weight of lint	...	159·65	29·04
Weight of seed	...	388·00	70·51
Dust and Grit	...	2·60	·45
		550·25	100·00

General Remarks.—Slight stain throughout the sample. Length of staple average 1⅜ inch. Lint very strong and regular and good lustre.

Var. Allen No. 25.—Area 14 acres; yield 6,925 lbs.=494 lbs. per acre.

Ginning Test.—Weight of Seed Cotton delivered to opener, 4630 lbs.:—

		lbs.	Per cent.
Net weight of lint	...	1,389	30·00
Cotton Seed	...	3,196	69·03
Dust and Grit	...	45	·97
		4,630	100·00

General Remarks.—Slight stain and leaf. Length of staple 1⅜ inch to 1½ inch. Somewhat irregular. Lint fine, soft and silky and fine strength.

* Serere Farm. Main Cotton Crop Results.

Var. Nyasaland No. 32.—Area 37 acres; yield 21,836 lbs.=590 lbs. per acre.

Ginning Test.—Net weight of Seed Cotton delivered to opener, 6,923·5 lbs.:—

		lbs.	Per cent.
Total lint from gins	...	2,216	32·007
Cotton Seed	...	4,640	67·018
Dust Grit and Loss of Moisture	...	67·5	·975
		6,923·5	100·000

* See Appendix No. 1.

Remarks.—Cotton of excellent quality and free from stain and leaf; length average $1\frac{1}{4}$ inch and regular. Lint very strong and good lustre. Seed plump and well filled.

Individual Plots.—Area 5 acres; yield 2,510 lbs.—502 lbs. per acre. No ginning test was made collectively but separate tests are shown on Table No. 1.

Kumi Farm.

Var. Sunflower No. 2.—Area 18 acres; yield 5,833 lbs.—324 lbs. per acre. No ginning test was made.

NOTE.—The above tests were carried out by Messrs. The Bombay—Uganda Co., Ltd., at their Rappayi ginnery under the general supervision of the Gen. Manager, Mr. W. E. Holl. The thanks of this Department are due to Mr. Holl for the careful way in which the tests were carried out and for the pains taken to get accurate results.

TABLE No. 1
SELECTION EXPERIMENT PLOTS, YEAR 1920.

Variety and Number.	Date of Sowing.	Area.	Yield lbs.	Remarks.	Average Length of Staple.	Strength.	Uniformity.	Silkiness.	Percentage of lint	Remarks.
Sunflower No. 3	June 1st	$\frac{1}{2}$ Acre	349	Germination fair, bollworm in Aug., much stainer in Nov.	Inches $1\frac{3}{16}$	Strong	Uniform	Very silky	29.9	Seed from this sown at Simsa 1921.
" " 6	"	"	255	Germination fair, much bollworm, green fly and stainer beetle.	$1\frac{1}{8}$	"	Fairly uniform	"	28.7	
" " 7	"	"	234	Germination good, disease on bud and leaf fairly prevalent.	$1\frac{3}{16}$	Fairly strong.	"	Silky	29.8	
" " 8	"	"	208	Germination good, first flower opened 5-8-20. Some disease on leaf.	$1\frac{1}{8}$	Strong	"	Very silky	29.3	Rather poor, same to be discarded.
Allen " 10	June 4th	"	337	Germination good, disease very slight.	$1\frac{1}{4}$	"	Uniform	"	28.9	
" " 11	"	"	235	Germination v. good, disease and pests prevalent.	$1\frac{1}{4}$	"	Very uniform	"	29.4	Excellent sample
" " 16	"	"	249	do	$1\frac{1}{8}$	Very strong.	Uniform	Silky	30.1	
Nyasaland " 18	"	"	233	do	$1\frac{3}{16}$	"	Very uniform	"	31.5	
" " 20	"	"	265	Disease and pests less prevalent.	$1\frac{3}{16}$	Strong	Uniform	Fairly silky	30.6	
" " 21	"	"	271	do	$1\frac{1}{8}$	Fairly strong	"	"	29.8	

NOTE:—Picking began on November 8th and the plants were pulled up on February 24th.

A number of individual plants were selected from above plots and sown separately in 1921.

Crop of Year 1921.

The past year was probably the hottest and driest on record in Teso district. The spring rains practically failed, the autumn rains failed altogether and the average maximum temperature was over 90° for eight months of the year.

Needless to say the year was an unsatisfactory one for all farm crops—low yields of produce were the rule, while the planting out of trees and shrubs was difficult and attended by disappointing results.

The following paragraphs summarise the year's work on the seed farms:—

A. Serere Farm.

BUILDINGS.—The erection of storehouse and workshop was finished. The former has been of faulty construction and the walls and floor are already riddled with white ants. The office and laboratory building was nominally finished but, as no outside door has been provided, only one room can so far be used.

The dwelling house was begun before the end of 1920 but is still unfinished. The failure to complete the buildings in time for this year's cotton season has been a great disappointment and has entailed postponement for another year of the important research work which should have been started two years ago.

A temporary house was built for the Assistant District Agricultural Officer in September at a cost of Fls. 350/-.

COTTON: MAIN CROP.—The main cotton crop consisted of three areas of 18 acres each which were sown with three distinct varieties, *viz.*, Sunflower, Allen and Nyasaland. This was an experiment to test the merits of the three varieties grown side by side under the same conditions of soil, climate and tillage.

The land was ploughed to a depth of eight inches by a double furrow disc plough and the whole crop was planted under excellent conditions. Sowing began on 25th June, and ten acres of each variety were sown on that and the six following days.

Planting distance 4' x 2' 3". Germination was good all over and a good stand of plants was obtained.

On the 25th July a further four acres of each variety were sown. Heavy rain on 28th did much damage to this section and resowing was necessary, and ultimately a good stand of plants was obtained. Planting distance again 4' x 2' 3".

On the 16th August the remaining four acres of each variety were sown and germinated.

The crop looked promising up to the middle of September, when insects began to attack both leaf and bud. From 1st October onwards the June and July sown crop steadily deteriorated in appearance. The plants looked sickly and neither rain nor drought seemed to have any effect on the crop, which at this date looks like becoming a partial failure. The reasons for this failure appear to be chiefly environmental. Insect pests have been really less prevalent than in previous years. Deep ploughing and the bringing to the surface of substances deleterious to plant growth which, combined with and aggravated by the low rainfall, are probably the chief causes of the disappointing results. From this it may be inferred that cotton should not be planted on deeply ploughed virgin soil. A food crop should be grown first, after which cotton may be sown with successful results.

The late sown crop, although stunted by the dry weather which set in in October, has not developed the sickly appearance of the other. The fresh green colour has been maintained throughout dry weather and at this date there are hopes of successful results from this cotton.

A remarkable feature has been the absence of aphid blight on the leaf, which usually accompanies long dry spells of weather; in fact there has been an almost entire absence of pests and disease of any kind.

Cotton picking began about the middle of November, but in view of the foregoing it is needless to say that the first picking has been a very small one. The cotton is, however, of good quality and free from stain. It may be said that the Allen variety has held its own against the other two and that the staple has not deteriorated in quality under the influence of drought, as was found in 1913, when this variety was grown in bulk in Teso District, and was discarded for that reason.

Experiment Plots.

A large number of selections from the crops of the previous year at Simsa and Serere were sown in plots on a selected area. The land was prepared as for the main crop and the seed was sown about the beginning of July. Germination was good and the crop looked healthy up to September, when it developed the same sickliness as the main crop, and at this date the crop does not promise satisfactory results.

General Crops.

MAIZE.—A small area of maize (variety Hickory King) was sown in April and harvested in July, the yield being at the rate of 2,220 lbs. per acre. The seed was sown in rows 3' apart and 2' 3" between the plants. There was no insect attack except for some little damage by white ants. The cobs were well developed and an excellent sample of maize resulted.

SIMSIM.—An acre of simsim, local variety, was sown on 9th May and harvested about end of August. Seed was broadcasted. Germination was good and growth was rapid and continuous. Yield 491 lbs. per acre, but much of the seed was lost in the process of harvesting.

A half-acre plot of the Kavirondo variety was sown in July. The seed germinated well but the crop wilted and dried up and was a failure. It is interesting to note that simsim must be sown before 15th May in Teso District to get a successful crop. This is stated by the natives of the district and seems to be correct.

BUCKWHEAT.—Two plots of buckwheat were sown in May and June respectively. The seed was broadcasted and harrowed in. Germination was good and growth was rapid. Some damage was done by rain-storms. The yield was 837 lbs. per acre.

LUCERNE.—A quarter-acre plot was sown with seed received from Kampala on the 7th July. The seed was broadcasted mixed with bulo to ensure even distribution. Germination was good and growth was rapid until dry weather set in. The crop was saved for seed but only about one pound was recovered. It seems likely that the crop will do well here and it is hoped to obtain better results next year.

SOY BEANS (GLYCINE SOJA).—An area of about 3 acres was sown on 17th August. Seed was broadcasted and germinated well. The crop did not attain full development owing to the dry autumn, but the yield of over 500 lbs. per acre was good in the circumstances. This crop is one of the easiest to grow and appears to suit even the poorest soils. Its cultivation should be encouraged among the natives who would find the bean flour a useful adjunct to their usual food.

BEANS (FRENCH TYPE).—A plot was sown in August and seed germinated well, but the dry weather seriously affected the crop, which became a failure.

SWEET POTATOES.—An experiment with four varieties of native potatoes was carried out, the plots being one-quarter of an acre each. The results were as follows:—

Nyolo	...	...	456 lbs. dried roots.
Mokoko	...	...	386 " "
Esagire	...	...	958 " "
Lengitawe	...	...	381 " "

The plots were planted in the first week in July, and although growth was vigorous for two months the crop was undoubtedly affected by the drought which reduced the yield. The best eating potato was Nyolo, the earliest was Mokoko, and heaviest yielder Esagire.

In addition to above, small areas were planted with sets from every variety known to the native in this district. In all 13 varieties were received but some of these were the same with different name. They were planted in rows on the edge of a swamp and several of them were washed away by a severe storm in July. No results of any interest were obtained from this experiment but sets have been retained for an experiment on a large scale next year.

RICE.—A small plot of about half an acre was sown with two varieties, one Mwanza and the other Nigerian. This experiment was unfortunate—the crop was damaged by a heavy storm in July and afterwards severely affected by the drought, and so the yield was very small; no disease was observed. The Nigerian seemed to stand the drought better than the other, and gave a yield of 579 lbs., the other only 71 lbs.

Six new varieties of Indian rice were received late in the year. Beds of each were sown on August 20th and plants were put out about September 22nd in separate plots. The crop did well considering the weather and late sowing and the seed collected will be retained for an extended experiment next year.

CHILLIES.—Seeds of the small or Uganda species of Capsicum were received from Jinja in July and sown in a nursery on 18th. Germination was not very good. A number of plants were planted out but these have not yet arrived at the picking stage. A trial on a larger scale will be made next year.

TOBACCO.—Six varieties were grown—four of these were grown on the farm last year, *viz.*, Lacks, Conqueror, Kavalla and Hestor, and two were importations, one from India and one from Assam. The seed was sown in nurseries on April 22nd, the beds being prepared in the usual way. Germination was slow and transplanting was not done till July. In spite of the long dry spells during the year the crop became well established and a fine yield of leaf was obtained. The leaf was dried in the old brick sheds abandoned by the P.W.D., and as these sheds are quite open, much of the leaf was taken by thieves. It is hoped to have a proper

drying shed for tobacco built next year. The leaf although small is of excellent quality and is in process of being cured.

NURSERIES.—The following seeds were received and planted in nurseries during the year:—

Cinchona sp., 3 species	Eucalyptus robusta
Areca Catechu	Cedrela Toona
Persea gratissima	Leucaena glauca
Mangifera indica	Coffea robusta
Grevillea robusta	Cocos nucifera
Carica papaya	Cassia Leiantha
Momordica Cochinchinensis	Cassia grandis
Juniperus Cedrus	Sour Guava
Pinus Canariensis	Cupressus
Albizia Lebbeck	Erythrina corallodendron
„ moluccana	Poinciana regia
West Africa Palm oil nuts	Bamboo “male” (Dendrocalamus
Oranges	strictus)
Paspalum notatum	Sisal (Agave rigida)
etc., etc.	

Germination was good in some cases, in others it was medium to total failure. A number of shelter and ornamental trees were planted out, but the ravages of white ants, aggravated by the long dry spells of weather, made planting out difficult and expensive.

A number of plants were issued during the year to gineries and rest camps in Teso and Lango.

The following shows approximately the area under cultivation:—

	Aeres.
Cotton Crop	60
Subsidiary Crops	12
Under shelter trees	10
Under Ornamental Shrubs and Sisal	2
Under Orchard-Bananas and Nurseries	6
TOTAL	90

B. Simsa Farm.

COTTON.—An area of 30 acres was sown with one of the selections from Serere, viz., Sunflower No. 3. Most of this area carried a crop of ground-nuts last year and a part of it was green manured by ploughing in “bulo” and ground-nuts which had been sown in February and March.

Sowing began on May 25th (four acres being sown in May, 16 acres in June, and 10 acres in July). The seed was of very good quality and it was sown under ideal conditions, consequently germination was good and an excellent stand of plants was obtained. White ants did some damage after singling of the plants and one plot of early sown crop was badly thinned out by these pests.

The May and June cotton made good progress during the year and more rapid growth has rarely been seen. By the end of September the plants were fully developed and bearing a heavy crop of bolls. Picking began on 1st October and by the end of the year this area of 20 acres had produced 250 lbs. per acre.

The July cotton, sown about the end of that month, did not develop so well as the other—the dry spells in September, October and November affected the crop and the plants did not attain the size and did not boll so well as the earlier cotton. Picking on this area began in December and 50 lbs. per acre were picked by the end of the year. The cotton was of excellent quality, the percentage of stained cotton being the lowest on record.

It may be stated that the practice of ploughing in green crops has given satisfactory results on the light sandy soils on this farm.

The difference in the crop between the manured and unmanured plots was very marked during the past year.

GENERAL CROPS.—The following list shows the areas and yields of the different crops grown:—

Name of Crop.	Area in Acres.	Yield per acre. in lbs.	Remarks.
Wimbi (bulo) ...	13	1200	6 acres of this were ploughed in for manure.
Maize (early) ...	2½	1100	A medium crop.
" (late) ...	3½	400	Affected by dry weather. Yield poor.
Ground-nuts ...	10	630	Much disease on crop resulting in low yield.
" ...	5	—	Ploughed in for manure.
Millet (matama) ...	5	1250	A moderate yield.
Beans ...	1½	400	A fair yield for light soil.
" (late) ...	3	220	Affected by dry weather.
Buckwheat ...	½	915	A successful crop.
Peanuts ...	½	540	A moderate yield.
Sweet Potatoes ...	½	1400	Dried potatoes.
" " (late) ...	1	450	A partial failure owing to drought.
Tobacco ...	½	250	Leaf small but of good quality.
Lucerne ...	½	—	Dried up—no result so far.
Simsim (Kav.) ...	½	—	Sown in Sept. Crop wilted and gave no result.
Sugar Cane (var. Uba) ...	½	—	Crop looks promising in spite of drought.
Muhogo ...	2	—	Planted out as food reserve.
Chillies ...	¼	—	Germination good but plants thinned out by white ants.
Mpindi (native beans) ...	1	150	A partial failure.
Paspalum notatum ...	¼	—	Sown in Oct. Seed did not germinate.
Cotton ...	30	—	
TOTAL ...	81		

With reference to the above it may be said that all crops sown before July were very successful and those sown after that date were partial or total failures.

A beginning was made last year with seed selection on above crops to improve their quality and yield. The best heads of wimbi and matama were selected in the field and the best maize cobs after reaping. These have been kept separate and will be sown in trial plots next year.

With regard to ground-nuts the best seeds are selected each year for sowing the main crop, the small seed being sown for ploughing in to increase the fertility of the soil.

BUILDINGS.—The temporary storehouses which were erected in 1916 and 1917 are now in a dilapidated condition and unfit for the storage of produce for any length of time. It was hoped that a permanent seed store would have been built on the plantation last year but this has not materialised. It was decided to send all produce to Serere for safe storage.

C. Kumi Farm.

This farm was, more or less, neglected during the year. Up to last year it had been maintained as a centre for ploughing instruction in Kumi County where chiefs and others could send their oxen and boys to be trained. Owing to low price of cotton and shortage of money among the people the development of ploughing was temporarily held up. Moreover, owing to outbreak of disease amongst cattle and quarantine restrictions, the free movement of cattle was restricted, and so instruction work at Kumi had to be temporarily abandoned.

It was deemed advisable to restrict the area of cultivation as there were no Government cattle available to carry on the ploughing and only native supervision with occasional visits by the writer, while funds were limited.

COTTON CROP.—A small area of about six acres was sown in July and August, cultivation being done by the hand hoe. The seed derived from one of the Sunflower variety selections at Serere germinated well and a good stand of plants was obtained.

In September a herd of cattle strayed on to the plot and did much damage to the crop, the tops of the plants being eaten off. The failure of the autumn rains completed the discomfiture of the crop which at this date looks like being a very small one.

GENERAL CROPS.—Areas of native bulo, maize (Hickory King) and beans were grown and gave successful yields. A large quantity of maize was issued to the natives of Kapiri and Mukura and Ngora for sowing, to replace the bulo crop which was a small one in parts of these areas.

Ploughing Instruction.

The development of the use of ox-drawn ploughs received a considerable check during the past year owing to the low prices realised for the cotton crop of the previous year and consequent scarcity of money in the hands of the natives.

Disease among cattle and restrictions on the movement of stock also had their effect on the industry.

The high cost of ploughs had also a hampering effect on development. The Ransome E. C. plough as at present priced (£9) is too expensive an implement for any but the moneyed chief to take up eagerly.

Unless a cheaper plough can be obtained at from £3 to £5 (the latter being the price of the E. C. ploughs before the war) development of ploughing among the petty chiefs and natives cannot be expected with cotton at 1d. and 1½d. per pound.

Instruction work was continued during the year at Toroma, Soroti and Serere in Teso, and Kabiramaido in Lango, while an itinerant native instructor visited certain Gombololas in Kumi County and carried out instruction work locally, the whole being under the supervision of the Ploughing Instructor, Mr. A. Fishburn.

The following is a return of the numbers of oxen and boys trained at the different schools during the past year:—

School.					No. of Oxen.	No. of Boys.
Kabiramaido	...	...	...	...	170	35
Serere	...	...	...	...	35	7
Kumi	...	...	...	...	32	8
Soroti	...	...	...	...	30	5
Toroma	...	...	...	...	16	4
TOTALS					283	59

The attention of ginning firms is drawn to the need for their help in the work of promoting cultivation by ox-drawn ploughs. If each firm would stock a few ploughs, trek chains, yokes and spare parts and carry out simple repairs they would do much to popularise the use of the plough and help to extend the area under cultivation of cotton.

R. G. HARPER,

Senior District Agricultural Officer.

GENERAL DISTRICT NOTES.

Cotton Crop, Year 1920.

Owing to the heavy fall in prices on the home market some difficulty was experienced in disposing of the cotton crop of 1920. The stringency of the money market restricted the operations of many of the cotton buyers, and one or two of the biggest buyers did not operate at all.

Buying began in January, but sales were slow and the natives were disinclined to sell at the prices offered, which showed a big drop from the prices

ruling the previous year. The natives in this respect for once acted unwisely, as the price fell from the original offer of Fls. 8/- to Fls. 5/- and as low as Fls. 3/- towards the end of the season.

In order to finish up the crop before the next sowing season, and to encourage the natives to proceed with cultivation the Government were obliged to step in and buy up the remainder, various ginners being employed to gin and bale and transport the cotton at fixed rates per pound of lint. The bulk of the crop was ultimately bought up by the end of May, but the last of it in some outlying parts of Teso and Lango was not bought until September.

The total crop realised was a very big one, and would have been bigger still if prices had been better, because a considerable proportion was left unpicked on the trees and was ultimately burned with them.

The total output and yields in Teso and Lango were estimated as follows:—

TESO DISTRICT	...	Total 8,750 tons, equal to 300 lbs. seed cotton per acre.
LANGO	„	... „ 4,120 tons, „ „ 342 „ „ „ „

Quality of the Cotton.

As usual there was a certain proportion of stained cotton throughout the two districts. The slump in prices at home compelled ginners to act warily at the markets, and to take more interest in the quality of the cotton being bought. Generally speaking, mixed samples were neglected and many of the ginners refused to buy any but A quality cotton, the stained and dirty cotton being left in the hands of the natives. This is an unsatisfactory state of affairs, and, if persisted in, will entail heavy loss to the grower and tend to discourage him from grading his cotton properly.

Ginners are well aware that there is generally a big percentage of stained or B quality cotton in this country and especially so in the Teso and Lango Districts, and if the native grower cannot get a market for this stuff he will be well advised to try some other crop for revenue, because cotton growing under such circumstances will not give him any return for his labour.

Ginners are also aware that stained cotton, if well ginned and graded under a distinguishing mark, will often realise a price not far short of that realised for A quality cotton sold at the same time.

It behoves ginners therefore to encourage the grower by offering two prices at the markets for A and B qualities; by buying all cotton which has been separated into two grades; and by refusing to buy mixed samples. The grower will then learn that he has everything to gain and nothing to lose in picking over and grading his cotton, and mixed samples at the markets will be, in a year or two, conspicuous by their absence.

Crop of Year 1921.

The past year has been an unfortunate one. The difficulty in realising the crop 1920 and low prices offered, together with unsatisfactory weather conditions, seem likely to end in disaster, as far as the cotton crop is concerned.

The spring rains were badly distributed and caused failure of early food crops. This in turn necessitated resowing of food crops and consequent delay in preparation for cotton. Fortunately the rains in July and August were good and the resown food crops were successful, which obviated any danger of a famine.

Cotton sowing began in July, but the bulk of the crop was sown in August and September. The crop although late was put in under good conditions. The seed was of excellent quality, and there was not a single instance of failure in germination. A good plant of cotton was obtained throughout the two districts and all that was needed to ensure a successful crop was favourable weather conditions during November and December. Unfortunately the autumn rains stopped abruptly on 15th October, dry weather set in, and has continued to the end of the year, the few showers which fell in November and December being insufficient to do any good.

The area sown compares favourably with previous years, although about 30% less than 1920, but the resultant crop is likely to be at least 60% less than last year's.

Insect Pests and Diseases.

Bollworm was reported from three areas in Teso in December, but very little damage was done. In fact pests and diseases have been rare, probably due to the dry autumn, and in consequence a white sample of cotton, free from stain may be expected at the markets next buying season.

White ants have done rather more damage than usual especially on the light sandy soils on the lake shores, and many plots have been badly thinned out by these pests. Closer planting of cotton has been recommended in these areas.

Cotton Picking and Handling.

Cotton picking began in December, and a small quantity has been picked at this date. There seems to be a disposition on the part of the natives this year to leave the ripe bolls unpicked too long. As a result the cotton during the high east winds becomes impregnated with leaf and dust which are difficult to remove, and are detested by both ginner and spinner; the former because it gives his lint a spotted appearance, and the latter because it interferes with the spinning of the yarn.

R. G. HARPER,
Senior District Agricultural Officer.

ANNUAL REPORT ON PLOUGHING INSTRUCTION, 1921.

For a few reasons the year's work fell short of expectations in the amount of new land ploughed, and also in the number of new ploughs purchased. The chief reasons being:—

- 1st.—The low price of seed cotton
- 2nd.—The very late rains
- 3rd.—The disease among cattle.

The first affected the sale of ploughs. Very many who were wanting ploughs had not sufficient money to purchase same.

The second affected the area ploughed. Until late in the season the ploughing of virgin soil was impossible.

The third made the training of oxen difficult on account of the quarantine.

In January much time was spent in visiting the cotton markets at Kelle, Ekwera, Lwala, and Kabiramaido.

In February all ploughs owned by natives in the Lango and Teso Districts were inspected. Simple repairs were done, and all spares needed noted and reported.

From the 17th April to the 14th May, I was buying cotton for the Government at Kumi and Bukidea (Teso District).

From September 21st to November 9th, I was in charge of the Government Experimental Station at Serere, Mr. Chandler, Assistant District Agricultural Officer, having gone on leave.

Ploughing schools were started at Serere, Soroti, Toroma, Kabiramaido and Kumi.

In addition (owing to the difficulty of moving oxen to the different schools) oxen were trained at Pilitok, Pallisa, and Putti Putti.

Remarks.

Plenty of ploughs were to be had during the whole of the year, at very reasonable prices. The ploughs chiefly used being "Ransome E. C.", although a few "Ransomes' Victory" are to be had. This is a light draught plough, well braced and an ideal implement for anyone with few oxen.

A slight improvement might be made by Messrs. Ransomes (at I think no extra cost) in all ploughs exported to Uganda. The making of the hake shorter and stronger would save a lot of breakages. As the draught rod is only used in the one position (*i.e.*, straight with the beam) there is no need for the 1" hake out here.

Should the cattle disease continue oxen training could be carried out at most of the Lukikos and periodical visits paid and instruction given, with I think great success.

A central depot for plough spares and if possible repairs, would encourage owners to keep their ploughs in good working order.

A. FISHBURN,

Ploughing Instructor.

ANNUAL REPORT

ON THE

GOVERNMENT PLANTATION, BUKALASA.

Weather.

The weather conditions during the year were of a very trying nature, more especially in regard to cotton. As will be seen in Table No. 1 below, the early rains were good, but abrupt change at the end of June to dry weather, which continued to the end of September followed by two months of rain and ending in extreme dryness, gave no hopes of good returns.

Rainfall.

TABLE No. 1.

				1920.		1921.	
				Rainy days.	Inches.	Rainy days.	Inches.
January	...	..	—	—	—	5	2.48
February	...	...	—	—	—	7	2.37
March	...	...	—	—	—	12	2.10
April	..	...	—	—	—	16	6.78
May	...	...	—	—	—	15	5.22
June	...	...	—	—	—	10	5.53
July	...	...	8*	4.25	6	2.30	
August	...	...	14	3.64	14	2.11	
September	...	...	12	3.84	15	3.18	
October	...	...	13	4.17	18	6.79	
November	...	...	13	3.73	15	4.63	
December	...	...	7	3.50	6	1.70	
TOTALS				67	23.13	139	45.19

* Record for 22 days only.

Temperatures.

TABLE No. II.

Month.			Average Maximum.	Average Minimum.	Highest Recorded.	Lowest Recorded.
January	...	...	88.96	61.64	95	58
February	...	...	87.71	62.35	96	60
March	...	...	88.00	62.54	92	60
April	...	...	84.73	63.33	89	60
May	...	...	83.12	62.61	87	60
June	...	...	81.76	61.63	87	59
July	...	...	81.74	59.35	87	55
August	...	...	82.54	60.09	87	55
September	...	...	87.20	60.46	91	57
October	...	...	84.96	62.22	89	60
November	...	...	84.46	62.36	91	60
December	...	...	87.00	63.03	90	61

Crops.

Further progress was made in opening up new ground and approximately 49 acres were placed under crops, the areas of each being as follows: —

			Acres.
Cotton	...	...	35.0
Simsim	...	...	1.3
Groundnuts	...	...	1.5
Sugar Cane	...	...	1.0
Chillies	...	...	.4
Rice	...	...	.3
Beans	...	...	.5
Millet (Mwere)	...	...	1.6
Buckwheat	...	...	1.5
Potatoes	...	...	7.0
Castor Oil	...	...	.5
Nursery	...	...	.5
			49.65

Cotton.

Two seasons' cotton come under review, the harvesting season of the 1920-21 crops and the growing season of the 1921-22.

1920-21 COTTON.

This crop gave good yields, as will be seen by the following table. The ginning tests were kindly carried out by the Uganda Co., Ltd., at Kalule, and the required seed returned. The season throughout had been favourable, which accounts for the good return from what is a poor shallow stony soil.

The Nyasaland originated from Kumi, the Allen Plots 2 and 4 from Simsa and Plot 3 from special seed.

Plot.	Variety.	Acreage.	Yield in lbs.		Total yield in lbs.	Yield per acre in lbs.	Ginning Percent- age.
			1st Quality.	2nd Quality.			
1	Nyasaland	3.5	1,895	914	2,809	802	32.88%
2 & 4	Allen	7.5	3,198	1,281	4,479	597	Not obtained
3	Allen	1.0	603	213	816	816	31.36%

The Nyasaland gave a large well covered seed, and a strong silky staple of an average length of $1\frac{1}{4}$ ". The Allen Plot 3 produced also a large well covered seed, with a fairly strong, very silky staple of $1\frac{1}{8}$ " in length, whilst Plots 2 and 4 produced a small well covered seed and a weak, silky, and fairly regular staple of $1\frac{1}{8}$ ". General selections were taken from all the above plots and five individual selections from the Nyasaland.

1921-22 COTTON.

The following are acreages of the various varieties sown this season :—

				Acre.
Nyasaland	...	...	...	18.25
Allen (special)	...	...	...	10.00
Sunflower No. 7	...	...	...	6.00
Selections	...	...	...	.75
				35.00

The Sunflower seed was obtained from Serere. Sowing commenced on the 21st June and was completed by the 31st August. All the Selections and the major portion of the Allen plot were sown during June. Owing to the unfavourable weather hardly any sowing could be done in July until towards the end of the month, while most was sown in August, the Sunflower being sown on the last two days of that month.

The Allen and Selections suffered through the late rains, while the remainder suffered somewhat owing to the lack of rains during August and September, but they recovered fairly well the following two months when good rains were experienced.

Aphids were rather numerous during August and September on the early-sown cotton; however, the late rains remedied this, but only to bring in diseases such as Anthracnose, mildew and boll-rotting. At the same time the Allen plot which was planted on virgin ground developed "curly leaf," a physiological disease due to soil conditions, and it was aggravated by the wet weather, only commencing to recover with the dry weather at the end of the year, and only a small yield is expected from this cotton.

The remaining plots were all planted on ground which had previously held various crops, and there is very little "curly leaf" present. The contrast between these plots and the Allen is very great and points out clearly that it is advisable to plant cotton on ground that has been previously occupied by other crops only. Cotton picking commenced on November 27th.

Other Crops.

Previous to the sowing of cotton, approximately 20 acres were occupied with various crops, as maize, beans, buckwheat, wheat, rice and sweet potatoes. The rice was a complete failure owing to blast disease and the wheat also was a failure through late sowing and dry weather. The beans were grown as a cover crop and only sufficient seed was reaped for future sowings and distribution, the remainder being dug in.

The maize was sold as food to porters except for an area of approximately two acres of Hickory King, which was reaped for use as seed and distribution to natives in the surrounding district for sowing. The yield of maize (in cob) was 2,700 lbs. per acre.

Simsim.

This was sown in May. The crop was a failure due to poor soil and unfavourable weather after June.

Chillies.

A small plot was planted out with seedlings in September.

Sugar Cane.

A second plot was planted in September in a more favourable position than the old plot, but unfortunately white ants have done a good deal of damage. This crop promises well, and when it is possible to extend cultivation in the vicinity of the swamp better results will be obtained.

Beans.

At various times small areas of different kinds of beans were sown and reaped to obtain a supply of seed.

Ground-Nuts.

This crop was sown in May and reaped in November. The yield was 768 lbs. per acre. Some of the seed is being kept for future sowings and the remainder being sold to porters.

Castor Oil.

This crop, which covers approximately 0·5 acres, is planted in lines to divide the cotton plots. At present there is only one variety, but it is expected that seeds of other varieties will be available for next year so that comparisons can be made as to yields and oil content. In addition to its possibly being a payable crop, it is of value as a temporary quick-growing wind break.

Jute.

A small plot of this was sown in August, but weather conditions were completely against germination, and experiments will be carried out in the coming year.

Millet.

A small area of millet was sown in September. The seed came from the Chua District of the Northern Province. This crop is understood to be able to withstand dry weather, and as far as its present appearance goes this appears to be the case. The inflorescence is not unlike a short bullrush and the seed is small and white. The type appears to be unknown amongst the Baganda.

Buckwheat.

Small areas have from time to time been sown on the hill-side and dug in to help to improve the soil, which is thin and poor.

Sweet Potatoes.

Approximately seven acres are under this crop, which is being grown for food purposes only.

Nursery.

A permanent nursery was formed in a corner of the plantation adjoining the Kigwe Swamp, and the temporary one made in 1920 was abandoned. Various shade and fruit trees have been raised from seed, while a few fruit tree seedlings were received from the Botanic Gardens, Entebbe, and planted in the beds. In addition a few decorative plants have been raised from seed and cuttings.

The following list covers the most important of the above:—Grevillea, Albizzia, Eucalyptus sp., Cedrela, Pinus, Spathodea, Cassia, Poinciana, Widdringtonia, Cupressus and Cinchona 2 sp. Seeds of the coconut and West African oil palm have also been sown.

There are a few seedlings of limes, oranges, loquats, guavas, papaw mango, soursop and avocado pears. Several bananas and a few fruit trees have been planted out on the plantation.

General.

As the old native road leading up the plantation was in an unsatisfactory position a new road was made, which is more or less in the centre of the plantation, and alongside which are to be erected the office, store, etc. At the time of writing this report two other roads are under construction, one to lead to the house and connect up with the road just mentioned and one to cross the plantation. When these are completed the old native road will be cut out. Towards the end of the year the Public Works Department commenced work on the permanent buildings and it is expected that the store and office, which are urgently required, will soon be available for use. With the present temporary store it is impossible to keep crops of any type satisfactorily. To natives in the district seeds of Nyasaland cotton, maize, buckwheat, and beans were distributed.

In the District.

No tours were undertaken during the year, but occasional visits were paid allowing of my return to the station on the same day.

Cotton.

The poorer natives on the average have sown nearly as much cotton as last season, while those natives who had large areas and employed labour have in some cases reduced their areas this season. The cotton

sown during late July and August is promising the best, while later sowings have more or less failed through the unfavourable weather. The crop as a whole is inferior to last season's which gave extremely good yields.

As a subsidiary crop this year in several Gombololas an increase was noted in simsim, but unfortunately in some cases the lack of buyers made it difficult for the native to sell, unless he cared to transport his crop to Kampala or sell in small quantities locally. This method of disposal wastes a good deal of a native's time when he should be preparing for and sowing his cotton, and until buyers in number are available nearer at hand, there is little encouragement for him to increase his area under this and similar crops. An attempt was made to get merchants to come out and buy but it was unsuccessful. The natives are quite prepared to grow more if they have a near market.

F. W. HALL,

Assistant District Agricultural Officer.

ANNUAL REPORT

ON THE

BOTANIC GARDENS. ENTEBBE.

Mr. C. Hazel, Assistant District Agricultural Officer, was in charge of the Botanic Gardens until he proceeded home on leave in August.

Rainfall.

The rainfall for the period covered by this report was well up to the average of the last four years, as will be seen by the table given below.

February and July were the driest months, otherwise the rainfall was fairly well distributed throughout the year.

The meteorological data giving further details will be found in Appendix No. 14.

RAINFALL FOR LAST FIVE YEARS.

MONTHS.	1917		1918		1919		1920		1921	
	No. of days	Inches	No. of days	Inches	No. of days	Inches	No. of days	Inches	No. of days	Inches
January ...	8	2'86	10	2'07	7	1'45	7	2'42	6	2'18
February ...	14	8'31	7	1'07	17	7'06	2	1'26	8	1'86
March ...	3	2'19	15	3'59	17	9'00	14	4'12	12	4'67
April ...	23	13'30	23	10'88	19	4'84	14	7'46	17	8'87
May ...	19	9'90	11	9'05	17	10'52	21	14'28	17	6'76
June ...	7	2'85	18	5'17	11	5'97	10	8'07	10	6'43
July ...	1	0'02	7	1'89	16	7'72	7	3'32	10	1'74
August ...	13	1'50	10	1'75	11	2'70	7	1'52	9	2'18
September ...	12	5'32	9	3'21	11	3'09	5	1'65	10	3'06
October ...	10	5'56	7	3'05	15	3'55	9	1'54	10	4'04
November ...	6	2'71	15	4'84	9	2'97	15	3'56	12	5'15
December ...	6	1'06	13	2'41	6	1'53	14	5'75	12	5'01
TOTAL ...	122	55'58	145	48'98	156	60'40	125	55'05	133	51'95

Labour.

There was a good supply of labour throughout the year, the average number of men employed being 73.

Nursery.

A considerable number of both economic and decorative plants have been raised and distributed during the year. April was an exceptionally busy month for the nursery owing to the free distribution of fruit trees when 5,231 trees were distributed, and 746 decorative plants, making a grand total of 5,995, which is more than the total for the remainder—eleven months.

The following is the total list of plants and seeds distributed throughout the year :—

PLANTS.		SEEDS.	
ECONOMIC.	DECORATIVE.	ECONOMIC.	DECORATIVE.
6,371	4,108	Packets ... 142 Single seeds 511	Packets ... 237 Single seeds 188

The above distribution of seeds include those sent to Botanic Stations in various parts of the world.

Introduction of Plants.

A large variety of seeds were received from various Botanic Stations throughout the year and a list of those seeds which have germinated is given below.

For the introduction of these plants especial thanks are due to the following Heads of Botanic Stations for their invaluable help with this work :—

La Mortola, Ventimiglia, Italy ;
 Director of Forests, Port Louis, Mauritius ;
 Director of Agriculture, Manila, Philippine Islands ;
 Director, Royal Botanic Gardens, Kew ;
 The Middle Egypt Botanic Station, Matania el Saff ;
 Bureau of Plant Industry, United States Department of Agriculture.

LIST OF INTRODUCTIONS.

Acacia horrida	*Juniperus Cedrus
Acanthus Caroli Alexandri	Melaleuca hypericifolia
Bauhinia violacea	Murraya exotica
Berberis aristata	Opuntia stricta
Cæsalpinia tinctoria	Pelargonium capitatum
Campanula lactifolia	Phoenix farinifera
Campanula pyramidalis	Primula malacoides
*Carabao Mango	*Rubus coreanus—Chinese
Cereus Forbesii	*Rubus coreanus—Asian
Cereus Guelichii	*Rubus strigosus X Idæus—Count
Cereus peruvianus, var. monstruosus	*Rubus strigosus—Ranere
Cereus jamacaru	*Rubus strigosus X Idæus—X Newman
*Cichorium Intybus	No. 23
Desmodium arboreum	*Rubus strigosus X Idæus X occidentalis—
*Ecballium Elaterium	Dr. Van Fleet raspberry
Echium fastuosum	*Rubus strigosus X Idæus—Brighton
Erythrina corralodendron	*Rubus phœnicolasius—Asian wineberry
Eschscholtzia californica	*Rubus occidentale—Seedling black
Geranium sanguineum	raspberry
Hakea suaveolens	Tacsonia manicata
Hovenia dulcis	Tacsonia mollissima
Hypericum Androsaemum	Ulex europæus
*Incarpus edulis	

With reference to the several species and varieties of Rubus fruits mentioned, they have all been planted out in trial beds, and have made excellent growth, but up to the present have not flowered or fruited.

Lawns and Flower Beds.

With the exception that during the dry weather small patches of the lawns dried up (this being due to the Gardens being so hilly, and suffering very readily from lack of rain), they have kept in good condition throughout the year.

On account of the large number of decorative plants and annuals which are now grown in the Gardens it was deemed advisable at the beginning of the year to make a new flower border to accommodate them, and also to relieve the nursery of growing annuals there for seed. This border was made in the lower part of the Gardens between the old cacao plot and the Forestry Arboretum and planted with such things as *Crotons*, *Dahlias*, *Salvia splendens*, *Helianthus sp.*, *Cosmos*, *Gaillardia pulchella*, *Petunia*, etc., etc. It has proved very satisfactory, and been a very attractive feature of the Gardens.

The beds in the Gardens containing *Roses*, *Cannas*, *Bougainvillea speciosa*, *Plumbago capensis*, *Chrysanthemums*, etc., have been up to their usual standard and maintained a good show of flowers throughout the year.

Several of the new introductions were planted out, besides other interesting subjects of which the following is a list:—

Aleurites triloba	Echium fastuosum
Aquilegia blanda	Feijoa Sellowiana
Aquilegia kitaibeli	Flacourtia Ramontchi
Callistemon coccineus	Hypericum Androsaemum
Callistemon rigidus	Opuntia elongata
Campanula latifolia	Opuntia Tuna
Campanula pyramidalis	Psidium Friedrichsthalianum
Cereus laetevirens	Psidium montanum
Citrus Hystrix	Psidium pumilum
Cytisus canariensis	Terminalia Catappa.
Echium aculeatum	

Labelling.

It was mentioned in last year's report that suitable labels should be obtained from home for the purpose of labelling the various trees and plants that were unlabelled. These have now been obtained, and prove very helpful to the visitors in the Gardens.

There are still other trees and plants without labels, and further supplies are needed to keep the Gardens up to the standard of a Botanic Garden.

Victoria Hotel Grounds.

At the commencement of the year these grounds, which adjoin the Gardens, were taken over, and are now included within the boundary of the Botanic Gardens. On taking over these grounds they resembled more a forest than a garden, and this necessitated the making of new lawns, various parts of the grounds having to be dug up, levelled and planted with lawn grass, also a large number of useless trees were cut out, such as "Bark cloth" *Ficus sp.*, "Lusambya"—*Dolichandrone platycalyx*, etc., leaving the more ornamental and valuable trees.

The average number of men employed during the year in the Victoria Hotel grounds was 12.

Cacao.

The records of yields from the numbered trees are given in the tables below, together with those for the previous years.

On comparing the present records with the previous years, it will be observed that higher yields are obtained at alternate years, and this may be the cause of the low yields during the period under review; on the other hand, the scale insect (*Stictococcus diversiseta*, Silv.) which is a troublesome pest here

undoubtedly destroys a large number of the pods. Lime sulphur mixture was used throughout the year to combat this pest, and no doubt to a certain extent was successful, and with further spraying of the trees with this mixture it should be possible to get the scale insect under control.

CACAO YIELDS.

PROGRESSIVE AND COMPARATIVE RECORDS.

PLOT No. 1.—PLANTED 1901.

CALABACILLO.

RED VARIETY.							YELLOW VARIETY.						
NUMBER OF PODS.							NUMBER OF PODS.						
Number of Tree.	1917-18	1918-19	1919-20	1920	1921	Total to Date.	Number of Tree.	1917-18	1918-19	1919-20	1920	1921	Total to Date.
8	54	21	48	47	49	219	4	266	215	172	234	64	951
9	124	75	141	110	120	570	7	262	369	166	153	48	998
12	7	36	33	42	13	131	10	57	42	65	85	96	345
13	75	66	90	37	39	307	14	85	144	66	94	106	495
28	5	1	7	31	3	47	22	312	172	199	156	276	1115
30	56	233	49	133	12	483	24	121	54	75	62	52	364
32	54	77	79	44	32	286	29	3	10	23	4	—	40
33	26	32	3	62	3	126	31	32	87	19	100	18	256
39	22	31	21	39	16	129	35	65	43	24	29	29	190
40	27	26	—	26	—	79	37	25	44	8	12	5	94
42	72	208	22	150	67	519	64	23	20	11	28	9	91
74	1	3	3	22	—	29	85	65	255	119	80	85	604
76	19	24	26	45	19	133							
80	57	118	71	27	78	351							
82	82	136	164	209	183	774							
87	9	16	—	80	59	164							
TOTALS ... 16	690	1103	757	1104	693	4347	12	1316	1455	947	1037	788	5543
Average per tree													
1917-18	43.1							109.6					
1918-19		68.9							121.2				
1919-20			47.3							78.9			
1920				69.0							86.4		
1921					43.3							65.7	

FORASTERO.

1	68	67	69	12	75	291	2	129	225	112	147	90	703
3	104	69	151	78	92	494	11	2	7	7	22	66	104
17	16	108	10	35	3	172	16	68	56	22	21	21	188
20	142	184	29	140	17	512	19	54	21	36	62	39	212
21	114	133	59	112	124	542	27	18	91	24	52	17	202
23	42	92	2	56	24	216	60	8	29	1	7	9	54
18	206	128	126	96	184	740	90	—	19	7	19	3	48
36	54	30	10	56	12	162							
44	4	16	12	22	14	68							
79	41	24	20	20	27	132							
TOTALS ... 10	791	851	488	627	572	3329	7	279	448	209	330	245	1511
Average per tree													
1917-18	79.1							39.8					
1918-19		85.1							64.0				
1919-20			48.8							29.8			
1920				62.7							47.1		
1921					57.2							35.0	

CACAO YIELDS.
PROGRESSIVE AND COMPARATIVE RECORDS.
PLOT No. 2.—LATER PLANTINGS.
CALABACILLO.

RED VARIETY.							YELLOW VARIETY.						
NUMBER OF PODS.							NUMBER OF PODS.						
Number of Tree.	1917-18	1918-19	1919-20	1920	1921	Total to Date.	Number of Tree.	1917-18	1918-19	1919-20	1920	1921	Total to Date.
49	31	10	4	59	9	113	43	110	33	8	28	32	211
52	34	157	2	114	52	359	48	21	23	—	33	9	86
55	10	77	12	81	59	239	51	6	65	—	8	79	158
63	11	26	—	58	—	95	56	57	17	2	53	34	163
65	23	69	4	40	23	159	67	96	68	104	167	96	531
69	15	16	33	18	30	112	68	54	55	15	64	48	236
70	26	11	3	67	54	161							
71	10	29	9	50	33	131							
84	37	64	—	31	34	166							
TOTALS 9	197	459	67	518	294	1535	6	344	261	129	353	298	1385
Average per tree													
1917-18	21.9							57.3					
1918-19									43.4				
1919-20		51.0								21.5			
1920			7.4	57.5							58.9		
1921					32.7							49.7	

FORASTERO.													
41	58	18	—	18	24	118	34	44	35	18	70	23	190
50	75	120	2	106	69	372	46	82	65	22	58	31	258
53	149	52	—	42	13	256	47	50	26	—	5	—	81
66	14	15	6	33	10	78	57	26	17	2	13	3	61
72	64	132	58	122	44	420	58	33	31	—	67	17	148
73	35	32	—	28	5	100	61	41	12	9	19	28	109
TOTALS ... 6	395	369	66	349	165	1344	6	276	186	51	232	102	847
Average per tree	65.8							46.0					
1917-18													
1918-19		61.5							31.0				
1919-20			11.0							8.5			
1920				58.2							38.7		
1921					27.5							17.0	

Para Rubber.

On the advice of Mr. Ashplant, the Rubber Expert, tapping was discontinued at the commencement of the year for an indefinite period, the reason being that the bark was not thick enough for further tapping and that the trees required thinning out. The plot consisting of series 1, 2 and 4 was therefore gone over and 370 diseased or weak trees were marked to be felled. Before felling these trees, they were tapped from five feet to the base on the full herring-bone system, after which they were cut cut.

The following table gives the yields and various data regarding the tapping of these trees:—

No. of Trees.	System of Tapping.	Date Tapping commenced.	Weight of Sheet Rubber.	Weight of Scrap Rubber.	Total Yield of Rubber.	Average per tree.	Average girth at 3 feet from the ground.	Date Tapping concluded.
370	Full herring bone alternate days.	8th March	lbs. 164	lbs. 5	lbs. 169	lbs. .457	Inches. 20	9th July

Meteorology.

The meteorological records for the year from all the meteorological stations in the Protectorate have been compiled and will be found in Appendix No. 14. At the end of the year all meteorological stations that were not already under the Provincial Administration Department were taken over by them, with the exception of stations where the Agricultural Department is permanently represented.

E. A. RUCK,

Assistant District Agricultural Officer.

ANNUAL REPORT

OF THE

GOVERNMENT MYCOLOGIST FOR 1921.

WITH AN

APPENDIX DEALING WITH AN INVESTIGATION INTO THE FUNGI FOUND ON RICE IN UGANDA.

1. I arrived at Mombasa from leave on March 23rd and resumed duty as Mycologist on March 30th.

2. Little general collecting has been done, but specimens of fungi connected with plant disease investigations have been added to the herbarium. As in previous years, I have been indebted to the Director of the Royal Botanic Gardens, Kew, for identifications. It was anticipated that the establishing of the Imperial Bureau of Mycology in London would assist greatly in mycological work in such places as Uganda where it is impossible to maintain a large library and difficult to keep in touch with all that is being done in other countries, and that anticipation is being realised.

3. Owing to the large amount of laboratory work to be done and the lack of assistance, I have been able to tour in only one district during 1921, that of Mubendi. I attended all the meetings of the Plant Pests Board during the period under review.

4. Many minor matters have been omitted from this report, so that the following paragraphs give details of only the major investigations that have been in progress during the last nine months. Owing to the prevailing conditions, an opportunity was available for a survey of the diseases of some of the so-called minor crops—an opportunity that could not be made in previous years and one that was not to be missed when it did occur. Such minor crops as native-grown cereals are of great importance to the food-supply of the country, and a full survey of the fungi occurring upon them is a work that should be undertaken as opportunity offers in order to throw some light on the losses sustained year after year through fungous diseases. Exact figures or percentages of losses are not available, but the writer feels impelled to say that his observations have led him to conclude that the losses are surprisingly small despite the presence in the country of such destructive fungi as, for example, the grain smut of *Sorghum*.

Coffee.

5. The brown-eye spot of leaves and berries (*Cercospora coffeicola* B. and Cke.) has been more in evidence than in previous years. The percentage of affected berries has been over sixty in some cases, and a fair amount of loss must have been caused thereby, but it cannot be said that the presence of the fungus causes alarm. Spraying has not yet been resorted to. The best trees are not attacked as severely as those in comparatively poorer health. *Loranthus*, which is easily controlled by cutting, has occurred at times, and the fructifications of *Polyporus coffeæ* Wakef. were found once, and then for only the third time in all, during the period under review. This *Polyporus*, which was described as a new species from material

collected in 1915, is associated at times with the coffee root mealy-bug *Pseudococcus citri*, and has never been found as an independent parasite of coffee. The fructifications occur around the collar of the tree or singly at soil-level in connection with lateral roots. The exact relation between mealy-bug and fungus has not been worked out. There is, however, a little direct evidence of its parasitism when accompanying the mealy-bug, but it has seemed sufficient in the past to confine combative measures to an attack on the mealy-bug alone. No other root troubles of coffee have been reported. The coffee anthracnose fungus (*Colletotrichum coffeanum* Noack) has been little in evidence, if at all, as a direct parasite of leaves, berries, or twigs. In fact, it has not been reported or found on either leaves or berries during the year. In every case in which its presence was demonstrated, its parasitism was very doubtful, for the material was invariably derived from trees that were wholly or partly in the dried condition known locally as dieback. The question of dieback and its causes has been discussed in Circular No. 4 which is available to all who are interested. It has been shown that the *Colletotrichum* of coffee is not an aggressive parasite but is at the same time a common saprophyte of coffee, ready and willing to attack and live upon the weakened and dead twigs on which it is usually found. Reference is made to large-scale dieback in which the middle portion or the whole of the tree is involved, and to small-scale dieback in which only a few branches or perhaps a cluster of young twigs are diseased. The latter alone may be entirely due to fungous attack, but it is much less common than the other condition. This nomenclature has led to a certain amount of confusion. It would be preferable to confine the word *dieback* to the general dessication that results from a complex of causes of a physiological nature followed and aided at times by the work of fungi, and to employ the word *anthracnose* to distinguish the results of the direct attacks of *Colletotrichum* that do occur. This point was brought forward in a paper published in the Kew Bulletin (1921, p. 61), and it would be well to bring the name *anthracnose* into current use. Towards the end of December, a form of anthracnose was found on coffee on various estates. It has not yet been investigated, but it will not be surprising if it proves to be the result of insect attack. It is said to cease entirely when shade is provided for affected trees. On abandoned estates, the effects on coffee of the unfettered growth of weeds resemble those generally described as dieback. This point bears out the old contention that dieback or dessication of the coffee tree is due almost entirely to lack of vigour brought on by unfavourable conditions, one of which is overbearing, another the presence of weeds, another probably the lack of shade, and so on.

During the year, attention was called to a white mould that occurred at the entrance to and on the walls of the tunnels made in coffee berries by the berry-borer, *Stephanoderes hampei* Ferr. The mould was isolated and found in pure culture to be one of the forms reported in Circular No. 4 (p. 19) to be carried by the Variegated Bug. It was alleged that it was causing the death of berryborers by suffocation or by parasitization of the insects, but no direct evidence was found to support either statement. The investigation might have been carried further, but it was suspended in order to await an entomological enquiry into the life-history of the borer which would answer certain questions that had cropped up. It is most likely that the fungus is merely saprophytic on the berry tissues disturbed and destroyed by the borer.

Hemileia vastatrix B. and Br. has been in evidence as usual. It is remarkable that this fungus, blamed as it was for the ruin of the coffee industry of Ceylon and having so terrible a reputation, should be regarded with almost complete equanimity by Uganda planters. Nowadays spraying for *Hemileia* is never dreamt of and much less is it attempted, and while it would be rash to assert that Uganda coffee has lost nothing through lack of spraying, it would be exceedingly difficult, apart altogether from the question of costs of materials and labour, to induce spraying to be taken up as a measure against *Hemileia* alone. After several years' observation of coffee under the influence, as it were, of *Hemileia*, it seems to the writer that the effects of the fungus, though never to be ignored or even despised, are not so harmful or so progressively weakening as was anticipated, and that they can be neutralised to a very great extent by the provision of the best cultural methods. It also seems as if Uganda coffee had successfully weathered the initial wave of *Hemileia* disease of a few years ago, and as if our experience has provided support for the assertion that the initial period of an epidemic disease is the worst in its results and that the disease gradually subsides

and lessens in virulence year by year. It should be remembered that cultural methods have been improved during the same time, and there may have been other factors in operation. It seems to the writer to be a great mistake to imagine that the presence of a fungus can account at once for all the apparent harm that ensues. The two best-known fungi on Uganda coffee are *Hemileia* and *Colletotrichum*, but they are not at the same time the greatest enemies of the crop. It may be mentioned in passing that a species of *Hemileia* nearly allied to *H. vastatrix* has been found on a *Strophanthus* on the Government Plantation, Kampala.

Hevea.

6. A few cases of the *Hevea* dieback which is due eventually to *Botryodiplodia theobromæ* Pat. have been reported, and the species of *Oidium* which causes the floury mildew of *Hevea* in Java has occurred on one private estate and on the Government Plantation, Kampala. The attack of the mildew is typical of the published descriptions. While the appearance of an attacked tree may be temporarily alarming, the effects of the fungus have not extended beyond the death of a few twigs and the deformation and loss of a few leaves. Little or no tapping has been done in the country during 1921, so that bark and cortex diseases have not been in evidence. Some stripping for brown bast has been carried out with apparent success by the officer in charge of the Kampala Plantation, and an experiment is in progress to determine the connection between tapping intervals and the incidence of brown bast. As has happened before, no cases of root disease of *Hevea* have been reported. *Ustilina zonata* (Lév.) Sacc. was found in the country in 1914, and *Fomes lignosus* Klot. has been found recently on a forest tree (*Baikiea* sp.) by the Forestry Department. Fortunately neither of these root fungi, both of which are destructive in the East, has attacked Para rubber in Uganda. This is due to the fact that the rubber-planted areas contained few stumps.

Cacao.

7. No investigations on the diseases of this crop have been conducted during the year.

Cereals.

8. On wheat, two well-known rusts, black-rust (*Puccinia graminis* Pers.) and orange-rust (*P. triticina* Eriks.), have been found in 1921. As far as is known, all the wheat in the country is affected by one or other rust. This remark applies to the three Indian wheats introduced from Pusa a few years ago. Associated with orange-rust is the leaf-spot fungus *Leptosphaeria tritici* (Garov.) Pass., and a *Helminthosporium*, provisionally named *H. sorokinianum* Sacc., is quite common. The loose-smut fungus *Ustilago tritici* (Pers.) Jens. has been found on one occasion, but it doubtless would be shown to be fairly prevalent if a systematic search were made for it. The scab fungus (*Gibberella saubinetii* (D. & M.) Sacc.) has been looked for without success. On maize leaves there have been found *Puccinia maydis* Bereng., and *Helminthosporium turcicum* Pass., but neither has been the cause of great damage. With reference to the æcidial stage of *P. maydis* which is known in America, Europe, and South Africa on species of *Oxalis*, attempts made in the laboratory to germinate the teleutospores of the rust and so to infect leaves of *Oxalis* proved abortive. It is probable that the æcidial stage has been dispensed with. It may be mentioned that *Darluca filum* (Biv.) Cast. occurs frequently in the sori of both *P. maydis* and *P. triticina*. A species of *Fusarium* was found on the sheaths of a rotted cob of maize, and an account of it will be found in the appendix to this report dealing with investigations into diseases of rice. Only one case of presumed downy mildew disease of maize has been encountered. The causal fungus was not found on the material, but the leaf symptoms seemed unmistakable. The plants were young, and, despite the disease, tassels were forming normally. No smuts have been found to date on maize in Uganda. The leaves of *Sorghum*, the native *matama*, are attacked by *Helminthosporium turcicum* Pass., *Colletotrichum graminicolum* (Ces.) Wils., and *Puccinia purpurea* Cke. These fungi have been found only on older leaves and the injury done by them is small. Of another nature, however, are the smuts of *Sorghum* of which two are known. These are the head smut and the grain smut, the former due to *Ustilago Reiliana* Kuehn., the latter to *Sphacelotheca Sorghi* (Link.) Clinton. A few experiments were carried out in the laboratory in order to ascertain the behaviour of the spores of the grain smut of *Sorghum*. It was found that the spores germinated readily (70-80% in five days) on filterpaper and soil moistened with water, and that no germination

took place when a weak solution of formalin or copper sulphate was used. This smut, therefore, is controlled in part by rainy weather, and fuller control of it could be obtained by use of the chemical solutions mentioned and by seed disinfection. The behaviour of the spores is apparently similar to that in other countries. Of the two smuts, the grain smut is the more common, but it cannot be said that the loss of grain caused by it even approximates in proportion the figures given for India, *viz.*, several millions sterling per annum. A further disease of *Sorghum*, the downy mildew or green-ear disease, was found in July last at Bukalasa. The disease results in partial or complete loss of the grain, but it has not occurred in such intensity as to attract notice. It is characterised by whitening in streaks of the young leaves and by a later browning, twisting, and crinkling. What should be a solid spikate ear becomes a mass of small twisted leaves. Young shoot-buds which sometimes develop laterally on the stalk may be attacked, become deformed, and fail to escape from the sheath of the protecting leaf. Affected plants should be torn up and burned. The oospores of the causal fungus were found in the tissues of affected leaves, but they were only half the size of the oospores of the fungus which induces the same disease in India. It is possible that the Uganda fungus is a different species of the genus that causes the downy mildews of cereals, and it is hoped to throw light on this point in time. The native *buro* (*Eleusine coracana* Gaertn.) appears to be attacked by a fungus which causes blackening of the internodes, often the lowest, of the stems. The blackened areas may be swollen or shrunken, and dissection of them shows the existence of a cavity full of mycelium corresponding in extent with the discoloration present. The mycelium penetrates in plenty the surrounding tissues. The determining of the time of attack of the fungus, whether early, so that its presence interferes with the ripening of the grain, or late, in which case it cannot be regarded as a harmful parasite, will show whether we are dealing with an active disease-producing agent or merely a weakly parasite whose presence is of little importance one way or the other. The fungus has not yet been successfully isolated. It is hoped to investigate this problem when material becomes again available. In the meantime, there is doubt as to the actual status of the fungus. The fungi upon Uganda rice are discussed in the report attached hereto as an appendix. The present position is that there is in the country only one major disease of rice, *viz.*, the blast disease due to *Piricularia oryzae* Br. and Cav. No other diseases have yet been encountered. The above records of cereal diseases will be incorporated in a circular to be published under the auspices of the Department of Agriculture.

Shade, Fruit, and Ornamental Trees and Plants.

9. A wilt of cashew-nut seedlings has been studied and found to be due to a species of *Fusarium* which is indistinguishable in culture from *F. udum* Butler which causes a pigeon-pea wilt in India and from the *Fusarium* described on carnations and other garden plants in 1919 (Kew Bulletin, 1920, p. 321). Series of cross-inoculation experiments have been and are being carried out, and it is hoped to publish results in due course. The same *Fusarium* has been found in the form of hyphae in the root-galls of *Antirrhinum*s caused by the nematode *Heterodera radicicola* Greef, and again in the same garden causing the wilt or crown-rot of carnations. In the latter case, the positions of fungus and nematode were reversed, for the nematode seemed to follow in the footsteps of the *Fusarium* and to be only a secondary agent of destruction. It may be mentioned that the above record is the first of a nematode attacking a plant in Uganda, and that *Heterodera radicicola* has not been found on either coffee or tea, both of which plants it has attacked in other countries. The *Fusarium* is evidently widely-spread and capable of being a virulent parasite. Further evidence, now being examined, seems to show that it may be at times only a weak parasite. An interesting symbiotic fungus, *Polysaccum crassipes* DC., has been found on Eucalyptus roots, and the list of hosts of the wet root rot fungus has been extended to include roses, *Grevillea robusta*, *Melaleuca leucodendron* and *Spondias lutea*. Further attempts have been made to induce the fungus of wet root rot to fruit in culture but with no success. Species of *Oidium* have been found on mango and grape, the latter being a well-known form, *Oidium tuckeri* Berk., and the two roseleaf fungi, *Sphaerotheca pannosa* Lév., and *Diplocarpon rosae* Wolf, have been in evidence as usual. Deaths of myrtle and jak-fruit seedlings and of garden nasturtiums were enquired into without the definite result of the discovery in either of any fungus that might have been the cause of death. *Albizzia moluccana*, grown as coffee

shade, has been found to succumb to attacks of *Botryodiplodia theobromæ* Pat. on the roots. This fungus was first found in 1919 on the roots of *Albizzia* trees that were dying and dead, and it has recently been found again in similar circumstances. Evidence points to the beginnings of its attacks on very small roots while the host trees are quite young. The progress made by the fungus seems to be slow, but the eventual death of the tree which occurs, unfortunately, when the trees are well-grown and beneficial to the coffee, is none the less certain. To date, the *Botryodiplodia* has not attacked coffee under diseased or dead *Albizzia*, but this immunity cannot be guaranteed to continue for ever. *Fomes lucidus* Fr. has been found once on a dead *Albizzia* which had succumbed to *Botryodiplodia* and is regarded as a saprophyte rather than an original cause of disease. The *Botryodiplodia* has also been noted as the cause of a dieback of pruned branches of *Albizzia moluccana*. In this matter, the only conclusion for the practical man is that the growing of *Albizzia moluccana* as coffee shade is not only jeopardised but entirely prohibited by the attacks of *Botryodiplodia*. The leaves of fig trees are badly attacked by *Uredo ficæ* Cast., which is known in Kenya and occurs also on the indigenous species of *Ficus*, and the fruits fall a prey to a rot caused by a species of *Colletotrichum*. A *Colletotrichum* has been found on dead shoots of the avocado pear, and it is hoped to study these species and others and so add to the information regarding Uganda species of this genus already published in the Kew Bulletin (1921, p. 57).

Cotton.

10. No reports of boll or leaf diseases, both of which are known in the country, have been received during 1921.

W. SMALL,

Government Mycologist.

Report on an Investigation into certain Fungi occurring on Rice in Uganda.

Rice has been grown by natives of this Protectorate for many years. The cultivation usually takes the form of small plots, and the kind of rice grown at the present day is exclusively what is called dry-land or mountain or highland rice. Apparently the early difficulties encountered in endeavours to teach the natives to irrigate where facilities for irrigation were practically lacking led to the adoption of dry-land rice and to the exclusion of other kinds from cultivation. Imports of seed have been made at different times from India, Ukerewe Island on Lake Victoria (then part of German East Africa), the Congo Belge, and Southern Nigeria, and rice has been grown in every part of the Protectorate at one time or another. Old reports on the progress of rice-growing in the different districts make mention at times of the failure of the crop through small yields due to unfilled heads, and invariably attribute the failure to unsuitable land, unfavourable climatic conditions, or to lack of interest on the part of native growers who were for the most part non-grain-eaters. It may be remarked that the symptoms of the blast disease of rice which is discussed hereinafter resemble the effects of drought and poor soil. The early recommendations made to the chiefs and their people with regard to preparation of land, sowing, and tending the crop were simple and sound, and it seems that, if they were carried out—and every effort was made to put them into practice through the medium of native travelling instructors—some other factor must have been at work to account for the disappointing results that were reported from time to time. It is impossible to say now whether this was so or not, or to determine the factor, for no investigations into the reasons for low yields or failure were carried out in the early days of rice-cultivation. Indeed, it is only within the last year or eighteen months that there has been an opportunity for scientific enquiry into the behaviour of local rice. In the meantime, the growing of rice has been taken up on a comparatively large scale in certain parts of Uganda, particularly in the Eastern Province, and it is essential that the investigational work which has been commenced should be carried on in the form of a survey of all the rice areas.

Introductory
and
historical.

Recent reports of rice disease.

The fungi occurring on rice in Uganda.

Letter from the Imperial Bureau of Mycology.

Recent investigations.

The blast disease of rice and its symptoms.

Previous to 1920, only one direct report of disease in rice had been received (Budiope, E. P., November 1916, Mr. J. D. Snowden, District Agricultural Officer), but the matter could not be carried further at that time owing to my going on military service. While I was on leave in 1920, Mr. Snowden, who was acting for me, received samples of diseased rice from Serere, Eastern Province, and he subsequently collected further material from a plot on the Government Plantation, Kampala. The latter material was sent to Kew and transferred for disposal to the Director of the Imperial Bureau of Mycology, who reported that the fungi found *in situ* were *Piricularia oryzae* Br. and Cav., *Helminthosporium oryzae* Miyake and Hori, *Leptosphaeria Michotii* (West) Sacc. (*L. Iwamotsi* Miyake), *Gibberella saubinetii* (Mont.) Sacc. (socio *Graphium stilboideum* Corda) and *Fusarium roseum* Link, the conidial stage of the *Gibberella*. The following further fungi have been noted on rice material. *Phoma glumarum* Ell. and Trac., *Epicoccum hyalopes* Miyake, and *Melanospora zamiae* Corda, and no doubt the list could be extended indefinitely. Of these fungi *Gibberella saubinetii* had not been recorded previously on rice. It is regarded as the cause, or one of the causes, of destructive diseases of wheat and maize in various parts. *Piricularia oryzae*, again, is the cause of the well-known blast disease of rice, and is now reported for the first time from Africa. At the same time the Director of the Bureau wrote to the Director of Agriculture in Uganda to point out the significance of the discovery of *Gibberella saubinetii* on rice and to suggest that in the presence of this fungus lay a clue to an obscure disease of rice in the East to which various causes had been assigned. He emphasised the importance of the matter, and a reply was sent to the effect that the study of *Gibberella* on Uganda rice would be taken up. At this point I returned from leave, and the matter was put at once into my hands. A considerable amount of work has been done, and it is my present and particular purpose to report on the relation of *Gibberella* to Uganda rice as well as on the disease actually found.

There was no lack of material for study, for there were available a large plot of young rice on the Government Plantation, Kampala, plots on the Bukalasa Seed Farm, several small plots on the Kakumiro Plantation, and native plots at Nakirebe near mile 16 on the Kampala-Masaka road. These were inspected in turn, but most of the material was drawn from the most convenient area, *viz.*, the Kampala Plantation. Not one of the plots was free from disease. In fact, the writer has not yet seen a completely healthy plot of rice in Uganda. The large proportion of empty or partially-filled grains has been particularly striking at Nakirebe and Kakumiro and only a little less so at Bukalasa and Kampala. The Eastern Province plots have not yet been inspected. That rice disease exists there is shown by the material received from Serere in 1920, and that it was severe is proved by the report in the paragraph under the heading "Rice" on page 29 of the Annual Report of the Department of Agriculture for the nine months ended 31st December, 1920. It may be added here that no troubles of rice due to sclerotium or nematode diseases, root rot, downy mildew, rust, bunt, or smut have been found to date in Uganda.

It can be said at once that the symptoms of diseased plants have corresponded exactly with the descriptions given of the blast disease of rice in the literature available.* Both leaves and stems are affected. Attention may first be called to the plants by paling of the leaf-blades and the presence of spots, usually longer than broad but often extending across the leaf, red-brown at first and becoming pale-yellow. Spots are also to be found on the leaf-sheaths and particularly at the junctions between blades and sheaths. The stems are frequently affected at both nodes and internodes, usually the upper, and they may break over in consequence. The most remarkable case of collapse occurred in a small plot of *sathia* imported from India and grown at Bukalasa (January, 1922); the whole stand of plants was levelled as if it had been rolled by the bodies of large animals. The ears may appear perfectly normal, or the glumes may be discoloured in whole or in part with a grey to black area extending from the base upwards. The pedicels may be similarly discoloured. The grains may be empty or partially or wholly filled. The attack of the fungus may occur early or late, and the resulting general appearance of an affected plot and the amount of grain carried may vary accordingly.

* Diseases of tropical plants, M. T. Cook, Macmillan & Co., 1913, p. 99—105 (by Metcalf).
Fungous diseases of plants, B. M. Duggar, Ginn & Co., 1909, p. 297.
Butler, Diseases of rice, Bull. 34, Agric. Res. Inst., Pusa, India.
McRae, Agric. Journal of India, 14, p. 65, 1919.

The rice on the Government Plantation, Kampala, which was under the closest observation of all the plots at hand, was attacked in part while it was quite young. A proportion of heads was therefore empty or only half-filled, but the plot was, on the whole, fairly evenly grown. The attack was milder in its effects than those observed at Kakumiro and Nakirebe. It may be remarked that the most serious manifestation of the leaf-spot form of the disease was found at Nakirebe. The spots were old when seen for the first time, and it was evident that infection had taken place when the plants were young. At no time has there been observed any diseased condition of the roots.

Numerous samples of diseased rice from all the four sources mentioned above were examined. Damp-chamber treatment after surface-sterilisation resulted in the invariable growth on leaf and stem lesions of typical conidiophores and conidia of *Piricularia oryzae*. Similarly, the fungus was recovered from tissue-fragments consisting of successive short lengths of stem cut from browned parts of both upper and lower internodes, leaf-blade and leaf-sheath lesions, and from pedicels and glumes of the head, by immersing the various parts in one per cent. agar in water, rice, prune, and potato-dextrose agars, after soaking in corrosive sublimate, dipping in alcohol, and flaming. The *Piricularia* was also grown in culture from mycelium obtained by splitting open discoloured stem tissues and removing fragments. In all the cultures, spore-production was sparing in amount. The few infection experiments carried out in the laboratory were successful in every case in producing typical lesions.

Isolation of the blast fungus, *Piricularia oryzae* Br. and Cav.

From the above evidence, that of the macro-symptoms of disease and that of the isolation of *Piricularia oryzae* from affected plants, it was concluded that the blast disease of rice was present on all the material I had the opportunity of inspecting in the field and examining critically in the laboratory. As has been mentioned, other fungi were found on diseased plants, and I shall now proceed to discuss the presence and significance of that one to which attention has already been called, viz., *Gibberella saubinetii* and its conidial stage which was indentified as *Fusarium roseum*. To date no attention has been given to the other rice fungi. With the possible exception of the *Helminthosporium* which appeared at times along with *Piricularia* on leaf lesions, they are regarded as saprophytes.

Blast disease of rice present in Uganda.

Frequent collections of material were made on the Government Plantation, Kampala, and in this way plants were examined in successive stages of growth. At no time were there found on this material either perithecia of *Gibberella* or acervuli or sporodochia of a species of *Fusarium*, and at no time did either of these forms appear in any of the tissue-fragment cultures. On the contrary, *Piricularia oryzae* was present at all times on stem and leaf parts and occasionally on glumes and pedicels also. Similarly, only *Piricularia* was demonstrated on the Nakirebe material. The Bukalasa and Kakumiro material, again, while in all cases yielding *Piricularia*, also yielded a species of *Fusarium* which was found in pink spore-masses confined to the discoloured glumes of empty or partially empty grains. The conidia were for the most part five-, six- and seven-septate. The *Fusarium* was apparently to be found only on the less fresh material which had travelled in a parcel before reaching the laboratory. No *Gibberella* was associated at any time with the *Fusarium*, and no perithecia of the *Gibberella* ever developed on the material whether it was kept in a damp or dry condition. The *Fusarium* was compared carefully with the duplicate material in the herbarium, and found to be the same as that identified as *F. roseum* by the Imperial Bureau of Mycology.

Other fungi on rice : *Fusarium roseum*.

It was easy to establish pure cultures of the *Fusarium* by direct transfer of mycelium and spores from rice glumes to culture media. Rice, prune, French-bean, and potato-dextrose agars were employed in this work. These media varied between 20° and 35° acidity in Fuller's scale. Growth was always rapid and aërial mycelium was plentiful in a few days. This mycelium was white at first, flocculent, granular and septate. It became later of a faint-pink or rosy-pink colour. The aërial mycelium sometimes was concentrically zoned in the potato-dextrose cultures, the centres being pale brown to crimson in colour with pale-pink at the edges of the areas, and growth in contact with glass was observed to be of a rich gold-brown colour. The prevailing colour, however, was white becoming and passing over into pale-pink. In prune agar, three-septate curved conidia measuring up to 40×5 mic. were numerous in four days. They were preceded by microconidia measuring up to 5 mic. long. Chlamydospores were formed later both terminally and intercalary,

The *Fusarium* in pure culture.

the terminal spores outnumbering the others. In French-bean agar, five- and seven-septate conidia were formed but were never as numerous as the three-septate spores. In hanging-drop cultures of small blocks of potato-dextrose agar inoculated with *Fusarium* conidia, the germ-filaments were seen to anastomose. The conidiophores were short, thick, and bunched together as if forming a stroma, and the abjoined conidia were at first one- and then three-septate and measured from 12 to 32 mic. in length. Camera lucida drawings of this conidial production showed a great likeness to the text figure 1 (E) given by Dickson and Johann,* but a closer inspection revealed differences in the morphology of the conidia. They were more curved and more slender in their whole length and also at the basal ends, and they did not have the pronounced pedicellate base shown in Atanasoff's † and Wollenweber's ‡ figures. Later, six- and seven-septate conidia were common. The length measurements of these conidia showed them to be slightly smaller than the figures given by Atanasoff. Numerous sub-cultures were made and so carried the fungus to the sixth and seventh generations, but no other conidial-production or perithecial-formation was seen. In fact, conidia became less numerous in successive sub-cultures. The *Fusarium* was also grown on steamed rice stems in Roux tubes. Growth was slow and poor, and conidia were very scanty; nor was any further formation noted. Likewise, rice heads on growing plants were sprayed with a suspension of *Fusarium* spores and kept under favourable conditions of moisture and temperature, but no perithecia were formed. Some workers have concluded that parasitism is a condition for successful conidial and perithecial production, but it is doubtful if it follows that non-successful spore-production indicates non-parasitism.

The same
Fusarium
from maize.

While this work was in progress, the same *Fusarium* was discovered on the sheaths of a maize-cob that was in part rotted and had been sent for examination from Bukalasa. Small numbers of conidia were obtained from browned and apparently dead parts situated about the middle of the outermost and next inner sheaths. No traces of the *Fusarium* were to be found on the remains of the cob (which had been destroyed by moulds) or on any other part of the plant, nor has the *Fusarium* or *Gibberella* been found on maize debris or living plants in Uganda. Extended search for the *Fusarium* might show it to be a common saprophyte. When grown in pure culture on the same media as were used for the rice *Fusarium*, this form behaved in a manner exactly similar to that of the rice *Fusarium*. There is, therefore, no need to go into details.

The
Fusarium
in infection
experiments.

Further work consisted of inoculation experiments with young rice, wheat, and maize plants. Viable conidia and mycelium obtained from the *Fusarium* cultures of both rice and maize origin were used, and the experimental plants were grown in tins out-of-doors. It was expected that the *Fusarium* conidia would be pathogenic if the *Gibberella* was also pathogenic. The *Fusarium*, as already mentioned, had been found on rice and maize, and wheat was introduced in view of the scab-disease caused by *Gibberella saubinetii*. Both inocula were placed by means of a suspension in sterile distilled water (1) among the roots of the plants, wounded and unwounded, (2) inside the lowest leaf-sheaths against wounded and unwounded stems, and (3) on the upper surfaces of wounded and unwounded leaves. There were thirty-six sets of experimental plants. A few plants in each tin were set aside as controls. After inoculation, the plants were covered with bell-jars for forty-eight hours and were thereafter kept out-of-doors. The tins were under constant observation for three months, during which time the plants, both experimental and control, grew well and showed no signs whatever of contracting any disease. The whole series of experiments was repeated later, and separate inoculations were made on odd plants with mycelium and spores of the *Fusarium* suspended in prune decoction, a fluid in which the spores germinated well. No positive results were obtained with either inoculum, and it was concluded that the *Fusarium* was not pathogenic to rice, maize or wheat. It is to be noted that there was neither primary infection on the young plants nor secondary infection on the mature heads of rice.

* Production of conidia in *Gibberella saubinetii*, Jour. Agric. Res. 19, 5, p. 235, June, 1920.

† Atanasoff, Fusarium-blight (scab) of wheat and other cereals, Jour. Agric. Res. 20, 1, p. 16, Oct., 1920.

‡ Wollenweber, Identification of species of *Fusarium* occurring on the sweet-potato, Jour. Agric. Res. 2, 4, p. 251, July, 1914.

Arising from the investigations here recorded is the following position: that without doubt there occurs in Uganda the blast disease of rice due to *Piricularia oryzae*, that a fungus with a bad record, *Gibberella saubinetii*, has been found on Uganda rice, but only once, and that its supposed conidial stage, a species of *Fusarium* has not been proved to be connected with the *Gibberella* and is not pathogenic to wheat or to either of the plants upon which it was found in the country, viz., rice and maize. Apart from the morphological differences recounted between the conidia of the Uganda *Fusarium* and those of *Gibberella* in U.S.A., differences that may not be of supreme consequence, we have to acknowledge that American investigators have reported* that the conidial stage of *Gibberella saubinetii* does not develop chlamydospores such as were found in culture to be associated with the Uganda *Fusarium*. If this fact alone is to be stressed, the Uganda *Fusarium* cannot be regarded as having any connection with *Gibberella saubinetii*. Further weight is lent to this conclusion by the absence of perithecia of *Gibberella* in nature and in culture, and by the non-pathogenicity of the *Fusarium*. Again, it should be noted that *Roseum* is a name denoting a section of the genus *Fusarium* rather than a single species, and that the *Fusarium* under investigation cannot belong to that section because of its possession of chlamydospores. For the same reason, it cannot belong to the section *Discolor* which it otherwise resembles. It may belong to one of the sections *Martiella* and *Elegans*, neither of which has a known perfect form, but the fact remains that its conidia resemble most nearly those of *Gibberella saubinetii*.

Conclusions.

The *Fusarium* not that of *Gibberella saubinetii* as at present constituted.

These present conclusions may be modified by future studies, for much critical work is required in order to identify definitely this and other Uganda species of *Fusarium*. It is not proposed to go further into the matter at present in view of the facts that the known pathogenic species of *Fusarium*† (provisionally labelled *F. udum* Butl.) is not of supreme importance, and that the present species is not pathogenic. It is difficult to account for the absence of *Gibberella saubinetii* from the rice material, and it may be said that the requisite conditions for its development have been attained only once.

It is concluded in the meantime that in Uganda there is only one major disease of rice, viz., blast, and it may be recalled that it has been stated that no other diseases have yet been encountered.

ANNUAL REPORT

OF THE

GOVERNMENT ENTOMOLOGIST, 1921.

No new insect pest of serious consideration has been noticed during the period under review though several minor pests, hitherto unrecorded as such in Uganda, have been observed. The year has been remarkable for the number and severity of outbreaks of the established pests of coffee; owing to the grave financial position of the planters, adequate control measures could not be undertaken in many instances. The high cost in Uganda of insecticides and appliances necessary for their application, often prohibits the use of chemical methods of control, and it is not always possible to devise simpler and effective methods.

Control of pests is further limited by the absence of a resting period for the crops.

Visits were paid during the year to twenty-nine estates.

* Wollenweber, loc. cit. p. 280.

† This species has been found on carnations, *Delphinium*, *Nigella*, *Cosmos*, cashew-nut and *Grevillea robusta* seedlings.

The following insects of economic interest have been observed :—

On Coffee.

- (1) *Antestia lineaticolis*, Stal var.—The variegated-bug.

Many serious attacks have been experienced. The only practicable measures for control, which consisted of hand-picking of all stages and of the breeding out of the egg parasites *Hadronotus antestizæ*, Dodd., and *Telenomus truncativentris*, Dodd., have not been altogether satisfactory. Despite continuous collecting of the bugs, and the proved high percentage parasitisation of eggs, attacks in some instances extended over a period of three or more months and it would appear that the pest migrates from some breeding place close to such estates. A thorough search will thus be necessary to determine the species of wild host plants in forest and other areas in the vicinity of coffee estates and elsewhere.

On several estates attacks were confined to certain plots of trees, but there appears to be no correlation between the incidence of attack and the situation and soil of such plots.

- (2) *Stephanoderes hampei*, Ferr, (*coffææ* Haged).—Berry-borer.

There have been many attacks on coffee distributed throughout the coffee growing areas.

Although the berry-borer is often responsible for the abnormal occurrence of light coffee beans, in other instances the fungal disease *Cercospora*, neglected cultivation, and the loss of leaves during the critical period of the growth of the berry, are concerned in the production of light beans.

A considerable amount of time has been spent on the study of the life-history, etc., of the berry-borer, but absence on safari interrupted the research and thus wasted a certain amount of effort. The eggs apparently are always laid in the bore made by the female in the berry, often among the excreta of the beetle. Eggs have been found in numbers up to ten in a single berry but it is probable that they are laid in much larger numbers for as many as twenty-seven adults were found in a single berry. Although eggs were often present in green or red berries, the largest number of eggs (and of other stages) were found in new "buni." The egg is like that of a pigeon in shape, translucent, white, and though small it can easily be seen without the aid of a lens. The incubation period is nine days. The larva is a hairy, creamy-white, footless grub with a head pale-brown in colour. The larvæ appear to be gregarious and have often been noticed to consume the whole of the bean in which they had hatched before attacking the second bean of the berry. Full grown larvæ vary in size according to the sex they are to become, the future male being two-thirds the length of the female. Pupation occurs in the berry among the excreta or at the blind end of the larval bores. The pupa is creamy-white in colour; the male is approximately 1.4 millimetres and the female 2.1 millimetres in length. The pupal period extends over seven to eight days. When newly emerged, the adult beetle is pale yellowish-brown. The insect rests without feeding for a period of five to seven days during which the colour gradually changes through brown to black. Males are considerably smaller than the females. The proportion of males to females is about one to nine thus indicating polygamy. Observations indicate that from berries containing no eggs or larvæ, adults do not migrate to other berries until all the food is exhausted. Beetles were kept alive in captivity for seventeen days without food since they had emerged. Females, fed in captivity, lived for an average period of nine weeks, the shortest period being eight weeks and the longest twelve and a half weeks; in these cases copulation had not occurred and eggs were not laid. The longevity of the male seems remarkably short in captivity, death occurring ten to fourteen days after emergence.

The investigation proved conclusively the nature of the small *Hymenoptera* which a planter had obtained from borer infested berries, and which he thought were parasites of *Stephanoderes hampei*. As was to be expected, to account for the waves of outbreaks of the pest, a parasite is present which normally holds the beetle in check. The following is an account, so far as has been determined, of the life-history and habits of the parasite of the borer. While examining infested berries a parasite was discovered in the act of laying eggs on the larger larvæ and pupæ of the berry-borer. Examination proved that one pupa and thirteen larvæ each had an egg attached to its body, in most instances on the ventral surface of the thorax. The egg is minute, elongated, and of the same colour as the host.

The parasite larvæ feeds during the whole of its life externally on the host, and when full-fed only the skin of the host remains. Pupation takes place in a delicate white silk cocoon; such cocoons are usually to be found attached to the inner side of the skin of the berry though frequently they are among the remnants of the bean tissues. The period from egg to adult is twenty-five to twenty-eight days. Adult parasites lived in captivity for fifteen days without feeding since they had emerged. When placed in a tube with a piece of bored coffee bean and some loose larvæ of *Stephanoderes*, an adult female parasite dragged its hosts to the bean; this is perhaps an instinct to protect the host from injury while the parasite is feeding. A female parasite caged in a tube with various stages of its host was observed to eat the whole of the contents of one berry-borer egg. As many as twenty-six parasites were bred from a single berry; the berry was "buni" in all cases where such large numbers of parasites were obtained, which is to be expected in view of the fact that host pupæ and larvæ of sufficient size for the complete development of the parasite are not found in considerable numbers in green or red berries. In the presence of borer-infested berries the adult parasite does not fly but runs actively among and into the berries.

The knowledge concerning the parasite will be applied in combating outbreaks of berry-borer. Wire gauze of forty to forty-four meshes to the linear inch allows the parasite to pass through but retains the beetle, and it is hoped that breeding of parasites from borer infested "buni" berries in containers fitted with gauze of the above mesh will prove an effective means of control.

(3) *Pseudococcus citri*, Risso.—Coffee-root mealy-bug.

On several estates this insect has been a very serious pest. The insect is often accompanied by a thick leathery covering layer of fungus which greatly hampers control. In such cases the roots have to be scraped before it is possible to reach the insect with an insecticide. Tobacco extract and soap spray proved a fairly satisfactory control in some cases.

There would seem to be a general dearth of available calcium in the soil of Uganda, and it is possible that applications of lime may be of assistance in combating the root mealy-bug. This is being tested.

(4) *Dirphya princeps*, Jord.—Yellow-headed stem-borer.

Reports of attacks by this insect have been common. Early recognition of the presence of the pest—while it is still in the primary branches—is essential to prevent much labour and possible loss of trees. Bored primaries become black and withered, and they may be distinguished from the effect of "die-back" by the fact that the former branches are flexible while the latter are brittle.

On one estate, examination of borer larvæ showed that some 40% were parasitised by a species of *Braconidæ* (No. 3939). The parasite larva feeds externally on its host, and when full-fed spins a cocoon of white silk in the bore and pupates. Partially grown borer larvæ provide sufficient food for complete growth of the parasite, and cocoons of the latter can be found in primary branches. When borer-infested primaries are pruned, instead of being burnt they should be kept in a box in order to allow such parasites as may be present to emerge. Several minute hyperparasites were bred from one *Braconid* cocoon.

(5) *Apate monacha*, F. and *A. indistincta*, Murr.—Stem-borers.

These pests have not been unusually abundant.

(6) *Anthores leuconotus*, Pasc.—Stem-borer.

An outbreak of this stem-borer occurred on one estate. The only previous record of this pest on coffee was from the same estate in the year 1918. In view of the fact that in nearly all cases the larva had bored some distance in the stem, "stumping" of the coffee trees and destruction of the larvæ was carried out for control.

Should this insect become more widely distributed it will be by far the most dangerous of the stem-borers in Uganda.

(7) *Bixadus sierricola*, White.—Stem-borer.

This insect, new as a pest of coffee in Uganda, was reported from Masindi District, but no details as the extent of its damage were given. It is a very serious coffee pest in West Africa.

(8) *Metadrepna glauca*, Hmp.—Leaf-eating caterpillar.

This is the most regular of coffee pests and its control is well known to all planters.

All small outbreaks ought to receive immediate attention in order to prevent really serious attacks by subsequent generations. Control measures should be commenced at the outer margin of the attacked area so as to confine the damage to that area.

(9) *Trirhithrum nigerrimum* var. *coffeæ*, Bezzi.—Fruit-fly.

The chief injuries due to this pest are the early ripening of infested berries, and the tendency for chipped beans to be produced during pulping as a result of the absence or depletion of gelatinous material which normally protects the beans. *Ceratitis capitata*, Wied., has not yet been bred by me from coffee berries.

(10) *Diarthrothrips coffeæ*, Will.—Thrips.

Attacks usually occur only after long drought. The insect should be periodically searched for during long spells of dry weather and any small outbreak dealt with immediately. A greyish mottling of the lower surfaces of the leaves and subsequent defoliation of the trees denote the presence of thrips.

The following sprays are recommended :—

(a) Commercial lime-sulphur 2 gallons; 3% Tobacco extract 2 gallons; Water 200 gallons.

(b) 7% Kerosene emulsion.

Strong fine sprayers must be used and all parts of the tree wetted. In addition to this measure all leaves fallen from affected trees should be collected and burnt.

(11) *An unidentified species of thrips*.

This insect is considerably larger than the above-mentioned *Diarthrothrips*. It was present on a few trees on one estate only. The attack causes tight curling of the margins of the leaves on the lower surface thus concealing the insect.

(12) *Leucoptera coffeella*, Staint.—Leaf-miner.

Though common on most estates no serious infestation has occurred during the year.

(13) *Anoplocnemis curvipes*, Fab.

One instance of damage by this *Coreid* bug has come to my notice. The insect sucks young shoots of both coffee and mango, causing the attacked parts to become black.

(14) *Saphronica* sp.

Numerous adults and larvæ of this *Cerambycid* beetle were found in stored "buni" coffee berries, a considerable percentage of which had been badly bored. Immediate heat treatment in a mechanical drier was recommended. Coffee, if stored for a considerable period, should be inspected periodically.

(15) *Ceroplastes* sp.; *Coccus viridis*.—Green, and other *Coccidæ*.

Various scale insects have been observed on coffee, but only in rare instances have their numbers been sufficient to warrant artificial control.

(16) *Cutworms*.

These have been responsible for the death of newly planted coffee seedlings. Damage may be prevented by the following methods :—

- (a) wrapping the stems at the collar with "byai"—dead banana petioles;
- (b) growing an intercrop of beans which the caterpillars much prefer to coffee (this crop would benefit the soil);
- (c) hand-collection of caterpillars;
- (d) the use of poisoned baits.

(17) *Gryllotalpa africana*, P. de B.—Mole-cricket.

Serious damage by this pest has not been common. Young plants are the chief sufferers. Poisoned baits can be used for control.

(18) *Toxoptera coffeæ*, Nietn :—Coffee aphid.

This pest is widely distributed in Uganda and is partly responsible for the deformed growth of leaves. It has not been sufficiently numerous to warrant treatment.

On Cotton.

This crop is almost entirely cultivated by natives, who in the present state of their knowledge of insects can scarcely be expected to carry out measures for control of pests. Fortunately, insects are rarely sufficiently injurious to cotton to warrant control.

The system in vogue in Uganda of burning the cotton plants after one crop is undoubtedly of great use in controlling the pests, and I consider that all growers of cotton should adhere strictly to this rule.

The identity of "stainers" on cotton and the various wild food plants is being investigated.

In order to determine whether *Pectinophora gossypiella* Saund. (the pink bollworm) was present in Uganda, samples of cotton seed from each district of the cotton growing areas were kept in cages in the laboratory for a period of several months. No specimen of the pest has been bred out.

An article was published in the *Official Gazette* and the local paper on the subject of pink bollworm to explain the necessity for stringent legislation and to make known the danger of introduction of this pest.

No specimens of the cotton leaf blister-mite (*Eriophyes gossypii*, Banks.) have been found. I am indebted to Mr. H. A. Ballou, Imperial Entomologist for the West Indies, for reference specimens of this pest.

- (1) *Aphis gossypii*, Glover.—Green-fly.

The insect has been seriously injurious during the year. The "lady-birds" *Chilomenes vicina*, Muls., and *Chilomenes lunata*, Fab., are predaceous on the pest.

- (2) *Earias insulana*, Boisd.—Bollworm.

Little damage has been done by this pest. One bollworm was found to be parasitised but unfortunately adults were not reared.

- (3) *Lobosia ælopa*, Meyr.—Bollworm.

This is rare on cotton.

- (4) *Argyroploce leucotreta*, Meyr.—Bollworm.

Very uncommon on cotton.

- (5) *Dysdercus nigrofasciatus* Stal, and *D. pretiosus*, Dist.—Stainers.

These have not been unusually abundant.

- (6) *Oxycarænus hyalipennis*, Costa, and *O. gossypinus*, Dist.

- (7) ? *Termes bellicosus*.

Isolated cases of death of cotton plants due to this insect have been observed.

- (8) A species of *Jassidæ*, and a species of *Aleurodidæ* have been noticed as minor pests of cotton.

On Sugar-cane.

This crop is as yet free from serious insect pests though grasshoppers, scale insects and ants have done a negligible amount of damage.

On Maize.

The following minor pests have been noted on this crop:—

- (1) *Pseudococcus citri*, Risso.—Mealy-bug. On the roots.
- (2) *Melanitis leda*, Linn.—Leaf-eating caterpillar.
- (3) *Sesamia calamistis*, Hmp.—Stem-boring caterpillar.
- (4) *Argyroploce leucotreta*, Meyr.—do
- (5) *Minthea rugicollis*, Walk.—Green seed-eating beetle.
- (6) *Carpophilus dimidiatus*, F.—do
- (7) *Coproporus* sp.—do
- (8) *Euxoa spinifer*, Hb.—Cutworm.

On Citrus.

The *Psyllid*, *Trioza* sp., though of widespread occurrence in Uganda, has been injurious only to seedling *Citrus* plants.

Various *Coccidæ* and *Papilio demodocus*, Esp., have occurred as minor pests.

On Sweet-Potato.

- (1) *Acræa acerata*, Hew.—Leaf-eating caterpillar.
- (2) *Cylas formicarius*, F.—Weevil.
- (3) *Aspidomorpha quinquefasciata*, F.—Leaf-eating *Cassid* beetle.
- (4) *Herse convolvuli*, Linn.—Leaf-eating caterpillar.

On Bananas.

- (1) *Cosmopolites sordidus*, Germ.—Banana root-borer.

No serious outbreak of this pest has been noticed. Larvæ and pupæ were found in dying stems from which fruit had been cut.

- (2) *Diaphone eumela*, Cram.—Leaf-eating caterpillar. Minor pest.

On Shade and other Trees.

- (1) *On Grevillea robusta* :—
 - (a) *Termites*—? *Termes bellicosus*, Linn.
 - (b) *Aspidiotus* sp. nov.—On roots.

- (2) *Erythrina* sp.

Urota sinope, Westw.—Leaf-eating *Saturniid* caterpillar. Parasitised by *Sericophoromyia quadrata*, Wied.

- (3) *Cassia floribunda*.

This plant, much used for hedges, is often killed by the stem-boring caterpillar *Xyleutes capensis*, Walk.

- (4) *Chlorophora excelsa*.

Much damage is done to the leaves, of young trees especially, by the gall-forming *Psyllid*—*Phytolyma lata*, Walk. A *Hymenopterous* parasite is sometimes responsible for the death of 60% of the nymphs.

- (5) *Young Forest Trees*.
Brachytrypes membranaceus, Dru.—Cricket.
- (6) *Bridelia micrantha*.
Acræa perenna, Doubl.—Leaf-eating caterpillar.

On Castor Oil Plant.

The following leaf-eating caterpillars have been observed :—*Arctornis producta*, Wlk.; *Orgyia georgiana*, Faw.; *Nudaurelia dione*, Fab.; and *Zebronia phenice*, Cram.

On Minor Crops.

- (1) *On Mustard*.
Pieris xolcalia—Leaf-eating caterpillar.
- (2) *On Cocaine*.
Rhodogastria atrivena, Hmp.—Leaf-eating caterpillar.
- (3) *On Onions*.
 - (a) *Diaphone eumela*, Cram.—Leaf-eating caterpillar.
 - (b) *Euxoa spinifer*.—Cutworm.
- (4) *On rice*.
Chaetocnema sp.—Flea-beetle.
- (5) *On beans*.
 - (a) *Antheua simplex*, Walk.—Leaf-eating caterpillar.
 - (b) *Catochrysops malathana*, Boisd.—Pod-eating caterpillar.

- (6) *On native spinach.*
Phytometra sp.—Leaf-eating caterpillar.
- (7) *On guava.*
 - (a) *Bunœa phædusa*, Drury.—Leaf-eating caterpillar.
 - (b) *Aspidiotus destructor*, Sign.
- (8) *On mulberry.*
Phytometra sp.
- (9) *On millet.*
Green seed-eating *Microlepidopteron* caterpillar.
- (10) *On wheat.*
 - (a) A *Microlepidopteron* stem-borer.
 - (b) Grasshopper nymphs.
 - (c) A species of *Coccidæ* on the roots.
- (11) *Marrow and other Cucurbitaceous vegetables.*
 - (a) Fruit-fly.
 - (b) *Hyperacantha castanea*, Allard.—Leaf-eating beetle.
 - (c) *H. collaris*, Weise.—Leaf-eating beetle.
- (12) *On radish.*
Phyllotreta mashonana, Jac.—Leaf-eating beetle.

Locusts.

Two swarms of *Faureia* sp. nov. were recorded during the year but in neither case was appreciable damage done to cultivated plants.

Pests of Stored Products and Household Goods.

- (1) *Diphyllus* sp.—Eating silk of *Anaphe infracta*, Walsm.
 - (2) *Calandra* sp.—In millet.
 - (3) *Bruchus obtectus*, Say; and *Calandra* sp.—In beans.
 - (4) *Calandra* sp.—In maize.
 - (5) *Calandra oryzæ*, L.—In rice.
 - (6) *Lasioderma serricorne*, Fab.—In cigarettes and cigars.
 - (7) *Plodia interpunctella*, Hb.—In wheat flour.
 - (8) *Lepisma* sp.—Eating silk and woollen clothing.
 - (9) *Coccotrypes dactyliperda*, F.—Boring in buttons of vegetable ivory.
- The garments to which the buttons were attached were also attacked, but only after the buttons had been destroyed.

Lac.

Attempts have been made but without success to transfer *Tachardia decorella*, Mask., from *Anona muricata* to its recorded alternative food-plant *Ficus sycamorus* for the purpose of cultivation.

Mulberry Silk.

The experimental rearing of *Bombyx mori* silkworms has occupied much time. The problem of irregular hatching must be solved before it will be possible to produce silk on a large scale.

A special report on this subject has been submitted to Government.

“Mbwa” Fly.

Simulium damnosum, Theob.—“Mbwa” fly.

This blood-sucking fly proves a serious pest in Busoga especially, preventing habitation by natives of certain areas. A preliminary investigation of the problem was carried out early in the year at the request of His Excellency the Governor and a report submitted. Other work has so far prevented continuation of the investigation of this difficult problem. I consider that at least a year's continuous study must be devoted to this subject before data could be accumulated sufficient to enable one to deal with the pest.

Laboratory Work.

Rearing of numerous adult insects from immature stages has been carried out. Numerous parasites have also been reared. A reference collection of immature stages of insects is in course of formation.

Insects for identification have been received from the Medical, Veterinary, and Forestry Departments. Ticks have been identified for the Veterinary Department.

Insects Received.

I am indebted to Dr. G. D. H. Carpenter for about a thousand insects, and to the following officers for various specimens received:—Mr. S. Simpson, Mr. A. R. Morgan, Dr. R. A. L. van Someren, Mr. C. H. Lankester, Mr. J. C. Kennedy, the District Commissioner, Bukedi, Mr. J. D. Snowden, Mr. R. S. Knowlden, Mr. G. T. Philpott, Mr. H. G. Smith, Mr. Strauss and Mr. Weir.

The Collection.

Numerous specimens have been added to the collection including species of families hitherto unrepresented here. Some two thousand insects were sent for identification to the Imperial Bureau of Entomology, London.

I am greatly indebted to the following entomologists for their kindness in identifying insects:—Dr. G. A. K. Marshall, Dr. B. Uvarov, Capt. J. Waterson, Mr. E. Meyrick, Mr. G. E. Bryant, Mr. K. G. Blair, Mr. N. C. Rothschild, Dr. Dyar (U. S. A.), Dr. G. Arnold, (Rhodesia), and Dr. Spaeth. Professor G. H. F. Nuttall and Mr. C. Warburton have kindly identified specimens of ticks for me.

Plant Imports.

One hundred and sixty-six consignments of plants and seeds were inspected during the year:—

United Kingdom	...	...	...	...	81
France	...	...	...	...	11
Holland	...	...	...	...	2
Belgium	...	...	...	...	1
Canada	...	...	...	...	2
United States	...	...	...	...	8
West Indies	..	...	...	...	3
Costa Rica	...	...	...	...	1
South Africa	...	...	...	...	7
Kenya	...	...	...	...	2
Tanganyika	...	...	...	...	1
Zanzibar	...	...	..	...	5
Belgian Congo	...	...	...	...	5
India	...	...	...	...	21
F. M. S.	...	...	...	...	1
Japan	...	...	...	...	9
Philippine Isles	...	...	...	...	5
Formosa	...	...	..	...	1
Total ..					166

The following insects were found in plant imports:—

Tenebrioides mauritanicus L., in cinnamon from Zanzibar.

Triboleum castaneum, Hbst. in cinnamon from Zanzibar.

Carpophilus hemipterus, L., in cloves from Zanzibar.

Coccotrypes pygmaeus, Eichk., in seeds of *Anona musesi* from Congo Belge.

Consignments of cotton seed from Egypt and India imported without permission were immediately destroyed.

Kampala Museum.

Numerous specimens of local products have been added to the economic section.

The flat roof of the Museum building leaks very badly and should be replaced by one of the ordinary type. I complained to the Public Works Department early in the year, but the defect has not yet been remedied.

H. HARGREAVES,
Government Entomologist.

ANNUAL REPORT

OF

THE GINNING INSPECTOR.

I commenced my duties on May 5th, and, during the period under review, paid 106 visits of inspection, involving 69 different ginneries. A complete list of these, showing the dates of my visits, and whether the ginnery was, or was not, working at the time of my visit, is given below.

A considerable number of ginneries, more particularly in Buganda, were not working at the time of my visit, having in most cases finished ginning their cotton before I had the opportunity of paying them a visit.

Speaking generally, and with few exceptions, very little trouble seems to be taken by the ginners to get the best possible prices for their cotton, and there appears to be very little attempt at grading or even picking out the badly stained stuff before ginning. In the great majority of instances, the cotton has been bought from the seller, just as tendered by the native grower, without any attempt at picking over. In this condition it is taken to the ginnery, and passed through the seed cotton opener, if such a machine in working order happens to exist at the ginnery, and then ginned, just as it comes, by quite small children in many cases. These children, if they ever received any instructions to throw out byai, grass, or stained cotton, generally omit to do so, and frequently pass byai, gunny twine, etc., through the gins with the cotton. Except where the greatest care is taken in picking over the seed cotton before it is taken to the gins, receptacles should be provided, in convenient positions, into which the operatives can throw all such matter, to avoid its getting into the lint leaving the gins.

Many of the ginners, more particularly in the Eastern Province, would almost appear to fail to realise that their cotton has any value, and handle it in a remarkably careless and irresponsible manner. Seed cotton is carried loosely in pieces of sacking from the seed cotton opener to the gins, generally passing across the lint at some point, and frequently one may see the portion of the floor, which should be reserved exclusively for lint, littered with bits of seed cotton which have escaped from the sacking whilst being so carried. Moreover, the pieces of sacking, in time, become frayed at the edges, and bits of yarn come adrift and find their way into the cotton going to the gins, and thence, with a little carelessness, into the lint.

In some ginneries the lint itself is actually carried from the gins to the press in such pieces of sacking, or weighed on a spring balance, in sacking, preparatory to baling. In some ginneries the lint is stuffed into sacks for weighing and storage until it may be convenient to bale. In all these cases there is considerable danger of pieces of gunny cloth or twine getting included in the bale.

There is a practice in vogue at certain ginneries of allowing the lint, as it leaves the gin, to accumulate on the stripping board of the gin and remain in this position until it falls of its own accumulated weight. By the time this has happened, the lint on the stripping board and that against which the roller has been continuously rubbing, has generally collected some considerable quantity of dirt, and is in a filthy condition. In some cases care is taken to keep this dirty lint from getting into the bales, in which case no harm is done, but in other cases it is allowed to get into a bale of otherwise perfectly good cotton. The practice seems to have little to recommend it and should be stopped, and the rollers kept free of accumulations of lint at all times.

Carelessness in oiling the machinery is at times responsible for a certain amount of oil-stained cotton getting included in bales of first quality cotton, and should be guarded against.

Byai, grass, rope, and local fibres of various kinds are used in fastening the seed cotton in the bags or other packages in which the cotton is brought for sale by the growers. Care should be exercised in seeing that these are picked out of the

cotton before it is allowed in the ginnery. The seed cotton opener cannot be relied upon to work miracles, although it would appear that, in many instances, the ginner seems to imagine that passing his cotton through this machine relieves him of all further responsibility in eliminating fibres and other rubbish from his cotton.

Again, these fibres are frequently used as a fastening for the hand-pressed bales turned out at many ginneries, and, consequently, find their way to the opening rooms of the repressing stations, whence with the slightest carelessness it becomes easy for them to get into the export bale. The supervision at repressing stations appears to leave much to be desired, the work being in some instances left entirely to the native staff.

Hand-pressed bales are frequently, perhaps unavoidably, conveyed over long distances by hand carts or bullock carts, in all sorts of weather. Whilst in hand-pressed bales the cotton is usually very liable to damage from rain. The hand-pressed bales sometimes get rolled in the mud, or lie in water, in the bottom of the lighter or canoe in which they are being conveyed to the repressing station, for some time. In such cases the cotton near the outside of the bale almost invariably suffers considerable damage, and should on no account be allowed to be packed with good cotton. Yet I have seen this being done. Great care should be exercised at repressing stations to avoid the inclusion of such mud-stained or weather-damaged cotton in a bale of first quality lint.

At repressing stations particularly, care should be taken against mixing cotton in bales intended for export. This has been frequently permitted to occur, and is usually the result of opening two or more hand-pressed bales at the same time and filling the pressbox from these alternately. If the cotton is exactly similar in all the hand-pressed bales, well and good, but if there is the slightest difference in colour, although it may pass unnoticed at the repressing station, it becomes glaringly noticeable on opening the export bale, when the cotton appears in alternate layers of white and slightly coloured cotton. A similar mixing is apt to occur when adjacent gins are ginning cotton of different colour. This is more likely to occur at ginneries where saw gins are employed and no seed cotton opener is used, and should be guarded against.

Local sale of their lint by certain of the small ginneries to the exporters appears to be responsible for a great deal of carelessness in the handling of their cotton by the former, since, in a normal season, almost any cotton that the owner chooses to describe as "A," or first quality, finds a ready market with the exporters, who will in some cases take over the cotton and pay for it without any attempt at discovering whether or not it is up to sample—if, indeed, any sample was ever asked for or submitted. This sort of indiscriminate buying by the exporters from the small ginneries undoubtedly tends to place a premium on careless handling by the latter, since the bad sells equally well with the good and fetches the same price. The remedy should lie with the exporter.

Legislation should not normally be necessary to compel a trader, however small, to make the best of his stock in trade, but in the case of Uganda cotton the demand by the exporters has hitherto been so keen that almost anything purporting to be cotton has been ravenously snapped up, frequently at the seller's valuation, without adequate care to provide against misdescription and fraud, with the result that the reputation of the whole of the cotton export of Uganda is likely to suffer.

The following is a list of the ginneries visited:—

6th May	...	L. Besson	...	Jinja	...	Not working
6th do	...	Narandas Rajaram	...	Jinja	...	Working
9th do	...	A. A. Visram	...	Jinja	...	Working
14th do	...	A. A. Visram	...	Jinja	...	Working
18th do	...	Math. Nanji & Co.	...	Nabirumbe	...	Not working
18th do	...	Math. Nanji & Co.	...	Kamuli	...	Working
23rd do	...	V. Haridas & Co.	...	Bukaboli	...	Working
23rd do	...	Math. Nanji & Co.	...	Busambatia	...	Working
30th do	...	Damodar & Karsanji	...	Nawandala	...	Not working
30th do	...	B. C. G. A.	...	Kaliro	...	Working
2nd June	...	Devji Keshavji	...	Vukula	...	Working
24th do	...	B. C. G. A.	...	Bugondo	...	Working
24th do	...	Foster & Mackertich	...	Kadunguru	...	In Construction
24th do	...	Tundoram Lekhram	...	Kamod	...	In Construction
25th do	...	B. E. A. Corporation	...	Serere	...	Not working
27th do	...	Jamal	...	Kumi	...	Not working
27th do	...	B. E. A. Corporation	...	Agu	...	Not working

30th June	...	U. C. B. & G. Co., Ltd.	...	Ngora	...	Working
4th July	...	Jamal	...	Kumi	...	Working
5th do	...	Jamal	...	Bukedea	...	Not working
6th do	...	Jamal	...	Kumi	...	Not working
7th do	...	Jamal	...	Kumi	...	Not working
9th do	...	Jamal	...	Bukedea	...	Not working
9th do	...	Jamal	...	Bukedea	...	Not working
10th do	...	Jamal	...	Kumi	...	Working
11th do	...	Jamal	...	Bukedea	...	Not working
11th do	...	Jamal	...	Kumi	...	Working
12th do	...	Jamal	...	Bukedea	...	Working
12th do	...	Jamal	...	Kumi	...	Working
14th do	...	B. C. G. A.	...	Kidongole	...	Working
14th do	...	Jamal	...	Bukedea	...	Working
14th do	...	Jamal	...	Kumi	...	Working
15th do	...	B. C. G. A.	...	Mbale	...	Not working
18th do	...	B. E. A. Corporation	...	Pallisa	...	Working
19th do	...	B. E. A. Corporation	...	Pallisa	...	Working
20th do	...	Math. Nanji & Co.	...	Kibuku	...	Working
20th do	...	N. Rajaram & Co.	...	Kidoto	...	Working
21st do	...	B. C. G. A.	...	Mbale	...	Working
22nd do	...	Valji Bhanji	...	Budaka	...	Working
22nd do	...	Math. Nanji & Co.	...	Kibuku	...	Working
23rd do	...	Jamal	...	Kumi	...	Working
23rd do	...	Jamal	...	Bukedea	...	Working
23rd do	...	Valji Bhanji	...	Butebo	...	In Construction
25th do	...	B. E. A. Corporation	...	Pallisa	...	Working
26th do	...	Devji Keshavji	...	Vukula	...	Not working
27th do	...	V. Haridas & Co.	...	Nasuti	...	Not working
28th do	...	E. P. Cotton Co.	...	Bubogo	...	Not working
27th August	...	V. Haridas & Co.	...	Bukaboli	...	Working
29th do	...	Math. Nanji & Co.	...	Busambatia	...	Not working
29th do	...	A. H. Khaderbhoy	...	Namatumba	...	Working
30th do	...	A. H. Khaderbhoy	...	Namatumba	...	Working
1st September	...	Valji Bhanji	...	Budaka	...	Working
1st do	...	Math. Nanji	...	Kibuku	...	Working
2nd do	...	Math. Nanji	...	Kibuku	...	Working
2nd do	...	B. E. A. Corporation	...	Bulangira	...	Not working
5th do	...	Narandas Rajaram	...	Kidoto	...	Not working
5th do	...	B. E. A. Corporation	...	Katuke	...	In Construction
7th do	...	Valji Bhanji	...	Butebo	...	Working
7th do	...	Abdulla Haji Nathu	...	Mkongoro	...	Working
8th do	...	Jamal	...	Bukedea	...	Working
8th do	...	Jamal	...	Kumi	...	Not working
9th do	...	Uganda Co., Ltd.	...	Kumi	...	Not working
10th do	...	B. E. A. Corporation	...	Agu	...	Working
12th do	...	Volabdas Jivraj	...	Kyere	...	Working
14th do	...	Bombay Uganda Co.	...	Rappayi	...	Not working
14th do	...	Bombay Uganda Co.	...	Komolo	...	Working
15th do	...	Bombay Uganda Co.	...	Amuria	...	Working
16th do	...	Uganda Co., Ltd.	...	Kabiramaido	...	Working
8th October	...	Math. Nanji's Press House	...	Jinja	...	In Construction
8th do	...	A. A. Visram	...	Jinja	...	Working
13th do	...	Rehemtulla Allidina	...	Kawempe	...	Working
13th do	...	Imperial Cotton Co.	...	Kawempe	...	In Construction
14th do	...	Bandali Jaffer	...	Kampala	...	Working
14th do	...	Narandas Rajaram	...	Kawempe	...	Not working
18th do	...	Uganda Co., Ltd.	...	Kampala	...	Working
8th November	...	Nakasero Trading Co.	...	Masaka	...	Working
9th do	...	D. & V. Patel	...	Kiziba	...	Not working
9th do	...	A. A. Visram	...	Masaka	...	Working
11th do	...	Popat Kalidas	...	Bude	...	Not working
11th do	...	A. A. Visram	...	Mbali	...	Working
11th do	...	Uganda Co., Ltd.	...	Mbali	...	Not working
11th do	...	Zaver Somji	...	Bweya	...	Not working
15th do	...	A. A. Visram	...	Kampala	...	Working
15th do	...	Kampala General Agency (Press House only)	...	Luzira Road	...	Working
19th do	...	Kampala General Agency	...	Bamunanika	...	Not working
19th do	...	Uganda Commercial Co.	...	Kalagala	...	Not working
19th do	...	A. A. Visram	...	Kalule	...	Not working
19th do	...	Uganda Co., Ltd.	...	Kalule	...	Not working
21st do	...	Gokaldas Purshotam	...	Kireka	...	Not working
23rd do	...	Uganda Co., Ltd.	...	Kapeka	...	Working
23rd do	...	Kampala General Agency	...	Semuto	...	Not working
24th do	...	L. Choblet	...	Luwero	...	Not working
24th do	...	Bandali Jaffer & Alcouffe	...	Waluvule	...	Working
28th do	...	Smith Mackenzie & Co.	...	Nakifuma	...	In Construction
28th do	...	Kampala General Agency	...	Nakiwate	...	Working
28th do	...	Bandali Jaffer & Alcouffe	...	Nakifuma	...	Working
29th do	...	Smith Mackenzie & Co.	...	Kitovu	...	In Construction
29th do	...	Nakasero Trading Co.	...	Kitovu	...	Working
29th do	...	Math. Nanji & Co.	...	Namasumbi	...	Closed
30th do	...	Smith Mackenzie & Co.	...	Kitovu	...	In Construction
30th do	...	Nakasero Trading Co.	...	Kitovu	...	Working
30th do	...	Math. Nanji & Co.	...	Namasumbi	...	Closed
30th do	...	Uganda Co., Ltd.	...	Namulonge	...	Working
30th do	...	Madhowji Dharamsi Mfg. Co.	...	Gayaza	...	Closed
2nd December	...	L. Besson	...	Kampala	...	Closed

O. E. LORD,
Ginning Inspector.

APPENDICES.

Appendix No. 1.

Serere Farm Seed Cotton.

PARTICULARS OF GINNING AND PERCENTAGE TEST CARRIED OUT AT RAPPAYI GINNERY.

Date of test	...	...	25th May, 1921.
Time started	...	...	7-30 a.m.
Time finished	...	...	1-15 p.m.
Duration of Test	...	...	5 hrs. 45 mins.
State of weather	...	...	Cloudy bright, moist after rain.
Mean temp. shade	...	...	85 deg. F.
Quality of cotton	...	...	First quality, grown at the Government Farm, Serere, from Nyasaland Seed originally.
(1) Total net weight of seed cotton weighed out from Rappayi Godown and delivered to the conveyor without being sun-dried	...	...	7,042 lbs.
(2) Less 2nd quality, stained, leafy cotton picked from conveyor	...	...	118.5 "
(3) Net weight delivered to opener	...	...	6,923.5 "
Percentage of 2nd quality cotton in relation to first	...	...	1.697%
ANALYSIS			
(1) Total lint from gins	...	...	2,216 lbs. ... 32.007%
(2) Total cotton seed	...	...	4,640 " ... 67.018%
(3) Heavy dust and grit from opener	...	...	17.5 " ... 252%
(4) Dust, immature cotton, fine lint blown up opener chimney	...	...	46 " ... 670%
(5) Evaporation of moisture and other losses in gin room	...	...	4 " ... 053%
TOTALS	...	...	6,923.5 lbs. ... 100.000%

After ginning the lint went through a further grading by hand picking, resulting as follows, viz. :—

Total lint delivered from gins	...	...	2,216 lbs.	...	32.007%
Less lint with small leaf, neps and stained cotton	24 lbs.				
Less stained and solid lint picked from the bearings of machines, etc.	...	10 lbs.			
Total lint losses reduced to 2nd quality	...	...	34 lbs.	...	1.534%

NET FIRST QUALITY LINT	...	2,182 lbs.	...	30.473%
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Final result proved the above to be : —Lint, very strong ; $1\frac{3}{8}$ " to $1\frac{1}{4}$ " length of staple ; clean white sample.

SOROTI,
25TH MAY, 1921.

W. E. HOLL,
General Manager,
The Bombay Uganda Company, Ltd.

Appendix No. 2.

IMPERIAL INSTITUTE OF THE UNITED KINGDOM,
THE COLONIES AND INDIA.

Report on Coffee from Uganda.

The samples of coffee which are the subject of this report were forwarded to the Imperial Institute by the Director of Agriculture and are referred to in his letter No. 1324/302 III, dated the 15th October, 1921.

The coffee was stated to have been grown on the Government Plantation, Kampala.

Description.

The samples consisted of ungraded coffee in the parchment, and represented four varieties. Their characters are given in the following table, together with the results of their examination at the Imperial Institute:—

No.	Label.	Weight of sample in lbs.	Description.	Percentage of parchment in berries.	Average weight of beans in grams.	Size of beans.
1.	<i>Coffea arabica</i> Bourbon.	2 $\frac{3}{4}$	Seed coat light brown, loosely adhering. Bean greyish cream, translucent.	18	0·14	Small
2.	<i>Coffea excelsa</i> Plot 1 (Culture No. 2)	2	Seed coat greenish brown to light brown, tightly adhering. Beans greenish cream to green opaque.	26	0·16	Small
3.	<i>Coffea excelsa</i> Plot 8 (Plyndel 2)	2	Seed coat greenish brown, tightly adhering. Beans similar to No. 2.	28	0·21	Medium
4.	<i>Coffea liberica</i>	1	Seed coat light brown, tightly adhering. Beans cream coloured, opaque.	33	0·23	Medium
5.	<i>Coffea robusta</i> Java 104 Field 25	3	Seed coat brown, tightly adhering. Beans greyish cream, opaque.	14	0·12	Small
6.	<i>Coffea robusta</i> No. 1 Progeny of Toro.	1 $\frac{1}{2}$	Seed coat light brown to brown, tightly adhering. Beans greyish cream, opaque.	14	0·14	Small
7.	<i>Coffea robusta</i> No. 3 Progeny of Toro.	2 $\frac{1}{2}$	Seed coat light to dark brown, tightly adhering. Beans similar to No. 6.	14	0·12	Small
8.	<i>Coffea robusta</i> No. 9 Progeny of Toro.	1 $\frac{1}{2}$	Seed coat and beans similar to No. 7.	13	0·14	Small
9.	<i>Coffea robusta</i> No. 16 Progeny of Toro.	3	Seed coat and beans similar to No. 7.	14	0·14	Small
10.	<i>Coffea robusta</i> Toro.	2 $\frac{1}{2}$	Seed coat and beans similar to No. 7.	13	0·12	Small

Commercial Value.

No. 1.—This Arabian coffee was regarded in the trade as of good appearance and quality, and it was considered that it should meet with a ready sale at the present time at about 88s. to 90s. per cwt. in London. It was pointed out that the sample contained a certain amount of withered and broken beans which lowered its market value.

Nos. 2 AND 3.—The Excelsa coffee represented by these samples was considered unattractive and undesirable for the London market, its current value being only about 47s. to 50s. per cwt.

No. 4.—Liberian coffee is not saleable in London for the United Kingdom market, but is occasionally in demand for export to foreign countries. Consignments of fair quality similar to the present sample would now realise about 60s. to 63s. per cwt. in London for this purpose.

Nos. 5—10.—These samples of Robusta coffee are regarded as of inferior character and are worth only about 45s. to 50s. per cwt. in London at the present time. The samples differ widely in quality from the Robusta coffee dealt with in Imperial Institute Report dated 12th December, 1918, which was an exceptionally good sample. It is not considered in the trade that the production of Robusta coffee resembling the present should be encouraged.

Remarks.

It will be seen from the foregoing results that the only coffee in the present set which is regarded favourably on the market is No. 1, representing the Arabian variety. It would therefore appear desirable to devote special attention to this variety in any further trials which may be carried out at Kampala, and to encourage its production in the Protectorate. If well prepared and graded, the Arabian variety realises the highest prices for coffee in the London market and has a steady sale at all times.

The Excelsa and Liberian coffees Nos. 2—4 are of much lower value than the Arabian, and the market for them is more restricted, so that they cannot be recommended for extended cultivation in Uganda.

The samples of Robusta coffee are of poor quality, and unless there is a prospect of producing this variety of coffee in commercial quantities equal to the sample dealt with in Imperial Institute Report dated 12th December, 1918, it is doubtful whether a remunerative market will be found for the product.

IMPERIAL INSTITUTE OF THE UNITED KINGDOM,
THE COLONIES AND INDIA.

Report on Starches from Uganda.

The nine samples of cassava, arrowroot and yam bean starch which were the subject of this report were forwarded to the Imperial Institute by the Director of Agriculture and are referred to in his letter No. 142/517 of the 7th February, 1921.

The samples were stated to have been prepared on the Government Plantation, Kampala.

Description.

Cassava Starch.—Seven samples of cassava starch were forwarded, as follows:—

No. 1.	"Bitamisi"	...	...	... Weight 3 lbs.
No. 2.	"Nakacacali"	...	...	3 $\frac{1}{4}$ "
No. 3.	"Bitajuma"	...	...	4 "
No. 4.	"Nyumbezunga"	...	...	3 $\frac{1}{2}$ "
No. 6.	"Mukedi"	...	...	3 $\frac{1}{4}$ "
No. 7.	"Nakitembe"	...	...	3 $\frac{3}{4}$ "
No. 8.	"Ruanda"	..	...	3 $\frac{3}{4}$ "

These samples consisted of coarse, lumpy starch of dull white colour with a greyish tint; many of the lumps were slightly yellowish on the surface. Nos. 2 and 6 had the best appearance, whilst Nos. 4, 7 and 8 were the least satisfactory in this respect. All the samples had an unpleasant musty taste.

No. 9. *Arrowroot Starch.*—Weight 2 $\frac{3}{4}$ lbs.

This was a sample of coarse, lumpy starch, of dull white colour with a slight buff tint; some of the lumps were pinkish-brown on the surface. The starch had a slight unpleasant taste and faint odour.

No. 10. *Starch of Yam Bean Tubers (Pachyrhizus tuberosus).*—Weight 1 lb.

A sample of coarse, lumpy starch, dull white in colour, some of the lumps being cream-coloured on the surface. The material was on the whole superior in colour and flavour to the previous sample from Kampala which was the subject of Imperial Institute report dated 28th July, 1920.

Results of Examination.

The samples were chemically examined at the Imperial Institute with the following results:—

Cassava Starches.

Samples No. 2 and Nos. 7 and 8, representing respectively the starches having the best and worst appearance, were selected for detailed examination. In the remaining samples only the amounts of moisture and ash present were determined.

The results are shown in the table below:—

	No. 1.	No. 2.	No. 3.	No. 4.	No. 6.	No. 7.	No. 8.
	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.
Moisture	13·0	15·2	16·4	17·6	13·7	13·1	13·1
Crude protein	—	Nil	—	—	—	0·5	0·4
Starch (by acid hydrolysis)	—	80·6	—	—	—	81·7	81·0
Ash	0·8	0·6	0·7	0·7	0·6	0·5	0·4

Arrowroot Starch.

Moisture	...	...	...	per cent.
Crude Protein	...	...	...	15·3
Starch (by acid hydrolysis)	...	...	...	0·2
Ash	...	...	...	79·6
				0·4

Yam Bean Starch.

		<i>Present sample.</i>	<i>Previous sample.</i>
		per cent.	per cent.
Moisture	...	12·2	13·1
Crude Protein	...	1·1	0·9
Starch (by acid hydrolysis)	...	81·9	79·1
Ash	...	0·5	0·5

See Imperial Institute report dated 28th July, 1920.

These results indicate that the starches were in general of fairly satisfactory composition, although most of the cassava starches gave a rather high yield of ash (up to 0·8 per cent). The amount of ash in commercial cassava starch does not usually exceed 0·4 per cent.

Commercial Value.

A firm of importers who examined the samples expressed the opinion that owing to their poor colour these starches would be difficult to sell in the United Kingdom for use as foodstuffs, but that if this defect could be obviated a demand might gradually be established. A second firm stated that these starches were insufficiently washed and overdried, and would only rank with medium quality tapioca flour, with which the market is at present overstocked. They added that such materials could not be remuneratively exported to this country under existing conditions as they would only realise at the present time about 11s. to 12s. per cwt., and might be difficult to dispose of even at that price.

Remarks.

The sample of cassava starch and of arrowroot are inferior in colour, texture and taste to the same materials already on the market from other sources. On the whole they are of promising character but they have not been sufficiently washed and are in a lumpy condition. Better preparation will be needed in order to produce fine, clean, white starches, free from unpleasant flavour, which would be suitable for export to the United Kingdom.

The sample of yam bean starch is superior in colour and taste to the sample of this material previously received from Kampala. It compares favourably in purity with commercial arrowroot starch of good quality, but would have to be better prepared in order to compete with the latter in colour and fineness of texture.

10TH AUGUST, 1921.

Appendix No. 4.

IMPERIAL INSTITUTE OF THE UNITED KINGDOM, THE COLONIES AND INDIA.

Report on Sugar from Uganda.

The samples of sugar which are the subject of this report were forwarded to the Imperial Institute by the Director of Agriculture and are referred to in his letter No. 1241/344 of the 20th December, 1920.

The sugar was stated to have been prepared by a firm at Entebbe.

Description.

“*No. 1. Brown.*”—Weight 2 lbs. This sample consisted of soft brown sugar, partly in the form of fine crystals and partly in small lumps. The sugar had a somewhat unpleasant odour and flavour.

“*No. 2. White.*”—Weight 1½ lbs. This sample consisted of sugar in the form of colourless to brownish-white fine crystals, together with a number of small lumps. A small quantity of woody and fibrous material was present. This sugar had a less pronounced flavour than No. 1.

Results of Examination.

The samples were chemically examined at the Imperial Institute with the following results which are shown in comparison with corresponding figures recorded for commercial brown sugar:—

	PRESENT SAMPLES.		FIGURES RECORDED FOR BROWN SUGAR.
	Brown	White	
	per cent.	per cent.	per cent.
Moisture	2·7	0·3	3·5—6·0
Ash	1·2	0·5	0·8—3·0
Matter insoluble in cold water	0·4	trace	— —
Sucrose	85·8	94·1	83·5—91·5
Invert sugar	5·8	1·2	3·0—6·0
Organic matter, other than sugars	4·1	3·9	— —

Remarks.

Sugars represented by the present samples would not be suitable for domestic consumption in the United Kingdom without further refining. As regards the amount of sucrose present, the sample of “Brown” sugar is low grade, whilst the “White” sugar approaches “Demerara” in this respect.

It is understood that these sugars are prepared by a hand process and that consequently they are only of local interest at present.

APRIL, 1921.

Native Agriculture—Crops under Cultivation.

Province and District.	Potatoes.		Millets.		Rubbers.		Cotton.	Coffee.	Plantains	Maize.	Dhal.	Beans.	Sim-Sim.	Sugar Cane.	Ground-nuts.	Cassava.	Tobacco.	Wheat.	Rice.	Chillies.	Cacao.	Peas.	Onions.
	English.		Matama.	Wimbi.	Para.	Other.																	
	Sweet.																						

ACRES.																								
BUGANDA :—	117,100	250	500	1,000	750	300	24,000	3,500	365,000	4,000	*	7,000	5,000	1,000	3,000	4,000	100	10	200	250	50	200	*	
	6,117	299	606	136	238	575	4,067	2,476	149,763	3,267	..	3,819	987	1,449	1,497	3,105	277	4	15	68	12	144	*	
	2,135	72	209	148	9	40	7,453	5,870	60,000	731	28	293	153	413	557	3,501	20	1	1	6	..	426	*	
	25,000	40	100	20,000	..	20	3,000	500	25,000	1,100	100	2,000	2,000	100	300	2,500	1,000	100	30	100	..	300	*	
	TOTAL	150,352	661	1,415	21,284	997	935	38,520	12,346	599,763	9,098	128	13,112	8,090	2,962	5,354	13,106	1,397	115	246	424	62	1,070	..
EASTERN :—	*	*	*	*	*	*	31,000	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	*	*	*	*	*	*	29,220	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	19,000	..	25,000	94,000	..	30	47,000	..	1,500	650	..	12,000	7,000	..	18,500	2,500	20	..	100	..	..	..		
	*	..	*	*	*	*	20,300	..	*	*	..	..	*	*	*	*	*	*	*	*	*	*	*	
	}											NO BASIS FOR AN ESTIMATE.												
TOTAL	19,000	..	25,000	94,000	..	30	127,520	..	1,500	650	..	12,000	7,000	..	18,500	2,500	20	..	100	..	..	..	..	
	NORTHERN :—	11,500	24	500	5,500	..	..	1,000	150	5,000	1,300	..	5,800	3,500	5	2,000	440	150	..	5	2	..	2,100	..
		Gulu	1,000	5	3,000	20,000	..	1,800	..	100	500	..	100	6,000	1	1,000	100	..	..	10	..	..	..	..
		Chua	2,000	..	25,000	25,000	..	500	..	4	200	..	6,000	6,000	..	4,000	..	..	..	50	..	..	..	..
		West Nile	85,000	..	31,000	40,000	..	202	..	30	700	..	4,500	30,000	..	800	300	20	..	600	..	..	10,000	..
TOTAL	99,500	29	59,500	90,500	..	..	3,502	150	5,134	2,700	..	16,400	45,500	6	7,800	840	170	..	665	2	..	12,100	..	
	WESTERN :—	15,000	5	1,000	30,000	..	..	2	900	50,000	1,000	..	20,000	1,000	400	800	500	5	400	100	..	..	2,000	30
		Ankole	25,000	15	4,000	18,000	..	..	..	150	20,000	2,000	2	10,000	10	300	4,000	221	..	..	..	..	11,500	..
		Kigezi	5,600	50	20,000	30,000	..	15	8	10,000	5,000	..	35,000	..	..	10	10	100	20	..	..	..	85,000	..
		TOTAL	45,000	70	25,000	78,000	..	..	17	1,058	80,000	8,000	2	65,000	1,010	411	1,110	4,510	326	420	100	..	..	98,500
RUDOLF :—																								
	Turkwel																							
	Turkana																							
Dabossa																								
GRAND TOTAL	313,852	760	110,915	283,784	997	965	169,559	13,554	686,397	20,448	130	106,512	61,600	3,379	32,764	20,956	1,913	535	1,111	426	62	111,670	80	

* Not known.

Native Agriculture—Live Stock.

Appendix No. 6.

Province and District.				Cattle.	Sheep.	Goats.	Horses.	Mules.	Donkeys.
BUGANDA:— Mengo				26,500	8,500	108,500	..	4	50
Entebbe				13,916	4,141	34,550	...	...	3
Masaka				16,611	2,503	9,885	...	...	4
Mubendi				12,000	6,000	30,000	...	2	2
TOTAL				69,027	21,144	182,935	...	6	59
EASTERN:— Busoga				44,710	18,500	45,700	...	...	...
Bukedi				118,000	*	*	...	3	28
Teso				172,307	25,308	91,526	...	6	10
Lango				80,000	36,000	66,000	...	...	1
Karamoja } Lobor }				No basis for an estimate.					
TOTAL				415,017	79,808	203,226	...	9	39
NORTHERN:— Masindi } Hoima }				2,720	4,012	19,444	...	...	2
Gulu				20,000	500	30,000	1	4	10
Chua				25,000	*	*	...	2	...
West Nile				*	*	*	...	...	4
TOTAL				47,720	4,512	49,444	1	6	16
WESTERN:— Toro				20,000	13,060	30,600	...	...	7
Ankole				89,000	58,000	116,000	...	2	2
Kigezi				40,000	45,000	50,000	...	...	...
TOTAL				149,000	116,060	196,600	...	2	9
RUDOLF:— Turkwel .. Turkana ... Dabossa ...				No basis for an estimate.					
GRAND TOTAL				680,764	221,524	632,205	1	23	123

* Not known.

European Agriculture.

COMPILED FROM RETURNS OF 133 PLANTATIONS.

Province and District.			Number of Estates.	Total Acreage taken up.	Total Acreage under Cultivation.	Total Acreage not Cultivated.	Acreage of Coffee (<i>Arabica</i>).		Acreage of Coffee (<i>Robusta</i>).		Acreage of Para Rubber.		Acreage of other Rubbers.		Acreage of Cacao.		Cotton.	Maize.	Sugar.	Tea.	Miscellaneous Crops.
							Under 2 years.	Over 2 years.	Under 2 years.	Over 2 years.	Under 5 years.	Over 5 years.	Under 5 years.	Over 5 years.	Under 5 years.	Over 5 years.					
BUGANDA :—																					
Mengo	...	...	(a) 56	27,872	9,520	18,352	188	5,429	34	86	2,126	5,650	...	302	180	1,699	542	55	156	...	16
Entebbe	...	...	6	2,670	1,222	1,448	42	957	...	5	480	439	...	...	...	89	...	10	35	...	17
Masaka	...	...	12	5,109	1,232	3,877	205	982	...	1	278	215	...	...	...	94	100	...	...	...	...
Mubendi	...	...	13	9,456	2,127	7,329	6	2,038	...	5	211	280	...	...	...	12	60	...	15	50	...
Total			87	45,107	14,101	31,006	441	9,356	34	97	3,095	6,584	...	302	180	1,894	772	65	206	50	33
EASTERN :—																					
Busoga	...	...	9	9,640	1,611	8,029	180	1,244	...	2	90	10	...	...	5	30	80	...	10	...	150
Total			9	9,640	1,611	8,029	180	1,244	...	2	90	10	...	...	5	30	80	...	10	...	150
NORTHERN :—																					
Buayoro	...	...	21	13,727	2,653	11,074	723	1,803	...	20	100	345	...	...	...	...	310	185	1	...	74
Total			21	13,727	2,653	11,074	723	1,803	...	20	100	345	...	...	...	...	310	185	1	...	74
WESTERN :—																					
Toro	...	...	16	9,401	1,335	8,066	171	1,136	...	...	...	...	...	...	...	...	...	3	2	1	22
Total			16	9,401	1,335	8,066	171	1,136	...	...	...	...	...	...	...	...	...	3	2	1	22
Grand Total			133	77,875	19,700	58,175	1,515	13,539	34	119	3,235	6,939	...	302	185	1,924	1,092	253	219	51	279
																					(j)

NOTE :—Small acreages are also cultivated under the control of the various Missions.

(a) Of these 10 are temporarily closed.
 (b) 2,841 acres interplanted with coffee.
 (c) 4,717 " " "
 (d) 45 " " "
 (e) 150 " " "
 (f) 954 acres interplanted with rubber.
 (g) 877 " " coffee.
 (h) 220 " " coffee.
 (i) 66 " " rubber.
 (j) 166 " " coffee and rubber.

Comparative Statement of Exports from the Uganda Protectorate for the year ended 31st December, 1921.

ARTICLES.	Unit.	From 1st Jan. to 31st Dec., 1921.		From 1st Jan. to 31st Dec., 1920.		INCREASE.		DECREASE.	
		Quantity	£	Quantity	£	Quantity	£	Quantity	£
Cotton, Ginned ...	... cwt.	290,592	1,281,357	186,381	3,919,453	104,211	...	...	2,638,096
Coffee, Husked ...	...	44,682	89,452	36,808	129,901	7,874	...	...	40,449
" in Parchment ...	...	4,174	4,586	4,385	8,009	...	...	211	3,423
" Buni ...	...	...	...	1,919	3,361	...	...	1,919	3,361
Rubber, Wild ...	... lbs.	...	...	3,745	244	...	...	3,745	244
" Plantation ...	...	74,002	4,441	446,427	32,521	...	...	372,425	28,080
Cacao ...	... cwt.	329	1,475	1,235	4,933	...	...	906	3,458
Chillies ...	...	7,355	30,213	4,535	14,176	2,820	16,037	...	...
Ground-nuts ...	...	44	35	248	359	...	...	204	324
Cotton Seed ...	...	97,311	22,113	47,232	10,873	50,079	11,240	...	...
Castor Seed ...	...	269	302	7,763	828	...	...	7,494	526
Simsim ...	...	20,060	18,907	42,992	89,965	...	...	22,932	50,458
Simsim Oil ...	...	12	47	3	19	9	28	...	...
Cotton Seed Oil ...	...	...	...	257	1,150	...	...	257	1,150
Ghee (Clarified Butter) ...	...	481	2,075	1,744	9,539	...	...	1,263	7,464
Jaggree (Unrefined Sugar) ...	...	2,593	4,341	777	1,226	1,816	3,115	...	...
Hides and Calf Skins ...	...	1,985	6,211	20,528	118,184	...	...	18,543	111,973
Skins, Goat ...	...	2,996	20,034	2,617	33,363	379	...	...	13,329
" Sheep ...	...	4	7	159	767	...	...	155	760
" Miscellaneous ...	... value.	...	34	...	79	...	...	...	45
Hippo Teeth ...	... lbs.	2,114	211	7,589	876	...	...	5,475	665
Horns ...	...	6,562	4,524	1,322	1,411	5,240	3,113	...	...
Ivory ...	...	93,198	46,599	123,657	74,298	...	...	30,459	27,699
Timber ...	... cwt.	306	343	1,074	905	...	...	768	562
Miscellaneous Produce ...	... value.	...	1,691	...	3,615	...	...	...	1,924
Goods, Manufactured, unenumerated	...	...	483	...	671	...	...	...	188
Goods, Unmanufactured, "	...	...	57	...	358	...	...	...	301
TOTAL ...	...	...	1,539,538	...	4,440,484	...	33,533	...	2,934,479

Net Decrease £2,900,946.

NOTE:—For the quarter 1st January to 31st March, 1920, values are calculated at Rs. 15/- to the £1 and subsequently Rs. 10/- or Fls. 10/- to the £1.

Comparative Statement of Exports from the Uganda Protectorate.

ARTICLES.	Unit.	Year ended 31st March, 1918.		Year ended 31st March, 1919.		Year ended 31st March, 1920.		Year ended 31st Dec., 1920.		Year ended 31st Dec., 1921.	
		Quantity	£	Quantity	£	Quantity	£	Quantity	£	Quantity	£
Cotton Ginned ...	... cwt.	99,395	537,083	98,188	965,951	130,464	1,209,663	186,381	3,919,453	290,592	1,281,357
" Unginned ...	...	282	548	...	...	...	...	...	...	...	...
Coffee, Husked ...	...	15,362	33,278	50,460	102,658	54,694	156,668	36,808	129,901	44,682	89,452
" Parchment ...	...	4,485	6,283	3,851	3,351	4,266	5,046	4,385	8,009	4,174	4,586
" Buni ...	...	...	...	...	...	...	...	1,919	3,361	...	...
Rubber, Wild ...	... lbs.	9,362	923	14,262	620	2,089	90	3,745	244	...	...
" Plantation ...	...	144,727	9,965	253,063	12,893	388,523	25,902	446,427	32,521	74,002	4,441
Cacao ...	... cwt.	114	138	209	331	660	1,231	1,235	4,933	329	1,475
Chillies ...	...	9,287	18,586	5,487	6,847	5,153	10,251	4,535	14,176	7,355	30,213
Ground-nuts ...	...	954	464	896	562	1,135	1,388	248	359	44	35
Cotton Seed ...	...	44,021	7,402	33,223	6,149	105,457	25,783	47,232	10,873	97,311	22,113
Castor Seed ...	...	329	171	737	468	8,518	1,443	7,763	828	269	302
Sim Sim Seed ...	...	17,337	13,048	939	1,008	23,384	30,697	42,992	69,365	20,060	18,907
" Oil ...	...	230	530	27	99	102	470	3	19	12	47
Cotton Seed Oil ...	...	...	...	448	837	335	876	257	1,150	...	...
Ghee (Clarified Butter) ...	...	7,090	23,270	6,443	26,122	3,196	15,303	1,744	9,539	481	2,075
Jaggree (Unrefined Sugar) ...	...	851	668	2	3	432	502	777	1,226	2,593	4,341
Hides and Calf Skins ...	...	22,634	76,707	15,053	64,125	52,171	242,238	20,528	118,184	1,985	6,211
Skins, Goat ...	...	2,273	6,789	1,948	8,162	4,200	27,870	2,617	33,363	2,996	20,034
" Sheep ...	...	46	41	19	15	95	360	159	767	4	7
" Miscellaneous ...	... value	...	10	...	29	...	9	...	79	...	34
Hippo Teeth ...	... lbs.	2,336	156	3,265	261	12,891	1,074	7,589	876	2,114	211
Horns ...	...	40	1	129	9	327	250	1,322	1,411	6,562	4,524
Ivory ...	...	109,426	43,770	94,795	37,918	161,091	65,952	123,657	74,298	93,198	46,599
Timber ...	... cwt.	778	411	3,040	1,939	1,975	1,311	1,074	905	306	343
Animals, Living ...	... No.	41	118	417	1,985	3	3	...	...	...	...
Miscellaneous Produce ...	... value	...	2,431	...	2,835	...	3,395	...	3,615	...	1,691
Goods Manufactured Unenumerated	...	...	1,892	...	2,220	...	694	...	671	...	483
Goods Unmanufactured Unenumerated	...	...	10	...	60	...	50	...	358	...	57
GRAND TOTAL ...	...	...	784,693	...	1,247,457	...	1,828,537	...	4,440,484	...	1,539,538

NOTE:—Exports for the year ended 31st December, 1920, includes the Quarter ended 31st March, 1920.

Comparative Statement of Exports—the Produce of the Uganda Protectorate—showing Quantities and Values from the various Ports and Stations, for the Nine Months ended 31st December, 1920, and Year ended 31st December, 1921.

ARTICLES.	Unit.	BUKAKATA.				ENTEBBE.				KAMPALA.				KIBANGA.			
		Year ended 31-12-21.		Nine Months ended 31-12-20.		Year ended 31-12-21.		Nine Months ended 31-12-20.		Year ended 31-12-21.		Nine Months ended 31-12-20.		Year ended 31-12-21.		Nine Months ended 31-12-20.	
		Quantity.	£	Quantity.	£	Quantity.	£	Quantity.	£	Quantity.	£	Quantity.	£	Quantity.	£	Quantity.	£
Cotton, Ginned	Cwts.	5,069	22,706	50*	4	1,092	4,773	...	...	95,096	423,918	32,236	741,553	...	...	...	...
Coffee, Husked	"	88	198	42	184	80	180	23	108	25,380	50,760	11,537	40,575	...	...	6,735	28,770
" Parchment	"	261	292	...	...	117	122	64	101	1,409	1,537	550	1,242	...	...	369	1,364
Rubber, Wild	Lbs.	...	...	...	...	...	...	1,890	164	...	...	...	...	...	...	...	...
" Plantation	"	...	...	1,150	115	24,150	1,449	24,702	1,848	41,116	2,468	75,339	5,721	...	...	39,454	2,802
Cacao	Cwts.	...	...	...	...	...	...	37	203	56	249	150	706	...	...	139	599
Chillies	"	64	234	27	93	82	367	3	12	866	3,382	306	1,092	...	...	...	...
Ground-nuts	"	...	...	33	45	...	...	...	...	5	4	22	40	...	...	...	...
Cotton Seed	"	...	...	...	...	...	...	...	...	49,524	11,170	9,185	2,252	...	...	...	...
Castor Oil Seed	"	2	3	...	...	...	...	...	...	267	299	237	266	...	...	...	...
Simsim Seed	"	...	...	...	...	218	220	...	...	2,092	2,109	1,652	2,338	...	...	...	...
" Oil	"	...	...	...	...	...	...	...	...	3	12	...	...	...	...	...	...
Cotton Seed Oil	"	...	...	...	...	...	...	...	...	...	...	161	900	...	...	...	...
Ghee (Clarified Butter)	"	20	85	143	959	5	21	...	...	167	716	380	2,336	...	...	...	...
Jaggree (Unrefined Sugar)	"	170	285	...	...	890	1,494	224	377	193	324	278	468	...	...	...	...
Hides and Calf Skins	"	350	1,179	4,229	29,638	...	...	3	17	1,148	3,456	2,524	16,288	...	...	...	...
Skins, Goat	"	51	349	56	703	...	...	...	...	1,677	10,874	914	15,444	...	...	...	...
" Sheep	"	...	...	2	11	...	...	...	...	1	2	13	69	...	...	...	...
" Miscellaneous	Value	...	...	...	...	...	...	...	...	...	32	...	13	...	...	...	...
Hippo Teeth	Lbs.	...	...	132	16	...	...	...	...	859	86	4,143	518	...	...	...	...
Horns	"	...	...	...	...	...	...	...	...	1,614	858	90	106	...	...	...	...
Ivory	"	...	...	166	133	...	...	...	...	53,763	26,882	64,360	41,788	...	...	...	...
Timber	Cwts.	120	134	...	...	230	115	110	55	37	41	68	69	...	...	...	...
Miscellaneous Produce	Value	...	133	...	555	...	215	...	77	...	811	...	3,244	...	...	...	...
Goods, Manufactured, unenumerated	"	...	197	...	158	...	7	...	52	...	...	...	227	...	...	...	...
Goods, Unmanufactured, "	"	...	...	...	20	...	3	...	14	...	...	...	196	...	...	...	...
TOTALS	...	...	25,795	...	32,634	...	9,078	...	3,105	...	540,106	...	877,451	...	19,934	...	33,535

COMPARATIVE STATEMENT OF EXPORTS—THE PRODUCE OF THE UGANDA PROTECTORATE—SHEWING QUANTITIES AND VALUES
FROM THE VARIOUS PORTS AND STATIONS, FOR THE NINE MONTHS ENDED 31ST DECEMBER, 1920, AND YEAR ENDED
31ST DECEMBER, 1921.—continued.

ARTICLES.	Unit.	JINJA.				MJANJIL.				OTHER PORTS AND STATIONS.				TOTALS.			
		Year ended 31-12-21.		Nine months ended 31-12-20.		Year ended 31-12-21.		Nine months ended 31-12-20.		Year ended 31-12-21.		Nine months ended 31-12-20.		Year ended 31-12-21.		Nine months ended 31-12-20.	
		Quantity.	£	Quantity.	£	Quantity.	£	Quantity.	£	Quantity.	£	Quantity.	£	Quantity.	£	Quantity.	£
Cotton, Ginned	Cwts.	110,740	481,201	83,114	1,838,078	34,959	156,300	19,338	377,166	43,636	192,459	35,650	822,130	290,592	1,231,357	170,338	3,778,931
Coffee, Husked	"	4,285	8,646	1,064	3,990	118	245	45	185	5,257	10,723	1,953	7,572	44,682	89,452	21,399	81,384
" Parchment	"	1,023	1,154	1,299	2,711	250	178	44	117	1,114	1,303	47	82	4,174	4,586	2,373	5,617
Rubber, Wild	Lbs.	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1,890	164
" Plantation	"	...	...	159,760	12,273	...	...	...	...	...	...	12,254	844	74,002	4,441	312,659	23,603
Cacao	Cwts.	129	578	472	2,609	...	...	...	...	...	...	...	...	329	1,475	798	4,117
Chillies	"	5,967	24,686	2,294	8,384	239	1,005	202	778	137	539	80*	...	7,355	30,213	2,832	10,361
Ground-nuts	"	12	10	76	130	19	15	...	...	...	...	...	...	44	35	131	215
Cotton Seed	"	27,610	6,250	24,333	5,785	196	44	...	...	19,981	4,649	3,959	953	97,311	22,113	37,477	8,990
Castor Oil Seed	"	...	...	...	...	...	...	...	...	...	...	...	...	269	302	237	266
Simsim Seed	"	1,123	1,132	16,203	29,050	1,638	1,550	565	963	14,987	13,894	10,091	17,782	20,060	18,907	28,511	50,133
" Oil	"	...	...	3	19	...	...	...	...	9	35	...	...	12	47	3	19
Cotton Seed Oil	"	...	...	...	...	...	...	...	...	...	...	...	...	...	...	161	900
Ghee (Clarified Butter)	"	116	499	38	253	127	538	237	1,601	46	216	2	15	481	2,075	800	5,164
Jaggree (Unrefined Sugar)	"	1,340	2,338	132	221	...	...	...	...	...	...	...	...	2,593	4,341	634	1,066
Hides and Calf Skins	"	197	610	2,543	15,943	274	920	799	5,474	16	46	32	194	1,985	6,211	10,130	67,554
Skins, Goat	"	705	4,419	583	7,672	433	3,430	75	881	129	951	19	212	2,996	20,034	1,647	24,912
" Sheep	"	3	5	71	381	...	...	45*	2	...	...	...	...	4	7	86	463
" Miscellaneous	Value	...	...	...	...	...	...	2	4	...	...	...	...	...	34	...	79
Hippo Teeth	Lbs.	272	27	760	95	907	91	300	38	76	7	560	68	2,114	211	5,895	735
Horns	"	29	12	147	169	...	...	...	...	4,919	3,654	860	964	6,562	4,524	1,097	1,239
Ivory	"	662	331	7,263	4,447	...	...	519	324	38,543	19,271	22,914	14,705	93,198	46,599	95,332	61,452
Timber	Cwts.	18	20	135	225	10	12	2	3	21	24	...	...	306	343	276	373
Miscellaneous Produce	Value	...	294	...	1,324	...	185	...	137	...	11	...	221	...	1,691	...	5,533
Goods, Manufactured,	"	...	50	...	2	...	4	...	2	...	142	...	81	...	483	...	547
Goods, Unmanufactured,	"	...	20	...	28	...	...	...	...	...	...	...	61	...	57	...	319
TOTALS	...	...	532,182	...	1,933,789	...	164,519	...	387,674	...	247,924	...	865,948	...	1,539,538	...	4,134,136

* Lbs.

Details of Exports from other Ports and Stations are as follows:—

ARTICLES.	Unit.	MUTAL.		LUSINGA.		MBULAMUTI		NAMASAGALI MASINDI PORT		ATURA		KACHUNG		EKWERA		KELLE		SANGAI		BUGONDO		LALLI		TOTALS	
		Quantity	£	Quantity	£	Quantity	£	Quantity	£	Quantity	£	Quantity	£	Quantity	£	Quantity	£	Quantity	£	Quantity	£	Quantity	£	Quantity	£
Cotton, Ginned	Cwts.	...	...	...	...	25,470	111,766	...	2	...	...	1,116	5,000	...	...	...	...	...	...	3,642	16,316	13,408	59,375	43,636	192,459
Coffee, Husked	"	165	296	33	59	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	5,257	10,723
" Parchment	"	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1,114	1,303
Chillies	"	...	...	65	218	72	321	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	187	539
Cotton Seed	"	...	...	...	...	6,301	1,505	...	...	...	...	...	...	...	...	2,875	678	...	...	3,693	814	7,172	1,652	19,981	4,649
Simsim	"	...	...	...	...	314	317	...	...	3,527	3,438	...	...	614	575	4,034	3,723	3,841	3,304	2,454	2,378	203	159	14,987	13,894
Simsim Oil	"	...	...	...	...	...	...	...	...	...	...	...	...	...	...	9	35	...	...	...	...	...	...	9	35
Ghee	"	...	...	...	...	2	7	...	...	...	...	...	...	...	...	15	62	1	3	5	31	17	87	46	216
Hides and Calf Skins	"	...	...	...	...	9	23	...	...	...	...	...	...	...	...	3	12	...	...	...	...	...	...	16	46
Skins, Goat	"	...	...	...	...	87	643	...	...	...	...	...	...	...	...	9	59	10	70	...	...	...	...	129	951
Ivory	lbs.	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	375	188	38,543	19,271
Horns	"	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	4,919	3,654
Hippo Teeth	"	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	76	7
Timber	Cwts.	...	...	...	...	21	24	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	21	24
Miscellaneous Produce	Value	...	...	...	...	...	6	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	11
Goods Manufactured	"	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	142
Unenumerated	"	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
TOTAL	...	...	296	...	277	...	114,612	...	29	...	3,438	...	5,000	...	575	...	4,569	...	3,377	...	19,543	...	61,461	...	247,924

ENTEBBE METEOROLOGICAL STATEMENT FOR THE YEAR 1921.

Lat. 0° 4' 31" N. Long. 32° 28' 30" E. Height of Barometer above M. S. L. 3842 Feet.

MONTH.	7 A.M.				2 P.M.				9 P.M.				Maximum Temperature.	Minimum Temperature.	Sunshine. Hrs. Mins.	Rainfall. Ins.	No. of days Rain fell.
	Barometer corrected and reduced to 32 F.	Attached Thermometer	Dry Bulb.	Wet Bulb.	Barometer corrected and reduced to 32 F.	Attached Thermometer	Dry Bulb.	Wet Bulb.	Barometer corrected and reduced to 32 F.	Thermometer	Dry Bulb.	Wet Bulb.					
1921.																	
JANUARY	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	6
FEBRUARY	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	8
MARCH	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	12
APRIL	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	17
MAY	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	17
JUNE	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	10
JULY	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	10
AUGUST	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	9
SEPTEMBER	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	10
OCTOBER	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	10
NOVEMBER	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	12
DECEMBER	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	12
MEAN FOR THE YEAR	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	133

**Statement of Extra Meteorological Observations taken
at Entebbe, for 1921.**

MONTH.				Solar Radiation Thermometer.		Terrestrial Radiation Minimum Thermometer.
				Black. Bulb.	Bright. Bulb.	
				°	°	°
JANUARY	...	...	...	138·5	101·4	55·3
FEBRUARY	...	...	...	136·2	100·3	55·9
MARCH	...	...	...	140·9	102·8	52·7
APRIL	...	...	...	139·4	100·8	55·3
MAY	...	...	...	138·2	99·1	59·6
JUNE	...	...	...	132·5	96·9	55·1
JULY	...	...	...	131·7	92·9	56·7
AUGUST	...	...	...	137·4	98·8	54·2
SEPTEMBER	...	...	...	140·8	101·5	54·9
OCTOBER	...	...	...	144·6	103·2	55·6
NOVEMBER	...	...	...	139·9	102·0	55·4
DECEMBER	...	...	...	141·1	101·6	54·3
MEAN FOR YEAR				138·4	100·1	55·4

**Statement of Extra Meteorological Observations taken
at Entebbe.**

MONTH.				Earth Thermometer 1½ feet deep.			Earth Thermometer 4 feet deep.		
				7 A.M.	2 P.M.	9 P.M.	7 A.M.	2 P.M.	9 P.M.
				°	°	°	°	°	°
JANUARY	...	...	...	76·1	76·2	76·1	75·9	76·0	75·9
FEBRUARY	...	...	...	76·3	76·5	76·5	76·1	76·1	76·0
MARCH	...	...	...	77·3	77·4	77·3	76·0	76·6	76·4
APRIL	...	...	...	77·6	77·9	77·7	77·0	77·1	77·0
MAY	...	...	...	77·1	77·3	77·3	77·1	77·1	77·2
JUNE	...	...	...	74·5	74·6	74·4	76·1	76·2	75·9
JULY	...	...	...	74·1	74·2	74·0	75·1	75·2	74·9
AUGUST	...	...	...	74·2	74·3	74·2	74·6	74·8	74·5
SEPTEMBER	...	...	...	75·9	76·1	75·8	75·3	75·3	75·1
OCTOBER	...	...	...	76·8	77·0	76·8	75·9	76·0	75·8
NOVEMBER	...	...	...	76·7	76·9	76·8	76·2	76·3	76·1
DECEMBER	...	...	...	76·9	77·0	76·9	76·4	76·4	76·2
MEAN FOR YEAR				76·1	76·3	76·1	76·0	76·1	75·9

**Statement Showing Average Hourly Velocity of Wind
for 1921 between the Hours of:—**

MONTH.				9 P.M. TO 7 A.M.	7 A.M. TO 2 P.M.	2 P.M. TO 9 P.M.
JANUARY	...	...	...	2·3	3·6	3·2
FEBRUARY	...	...	...	2·1	4·4	3·0
MARCH	...	...	...	2·5	4·6	3·6
APRIL	...	...	...	2·6	5·1	3·5
MAY	...	...	...	2·1	4·1	5·7
JUNE	...	...	...	1·9	3·4	2·5
JULY	...	...	...	2·6	3·1	3·4
AUGUST	...	...	...	2·0	3·8	2·7
SEPTEMBER	...	...	...	2·6	4·7	3·0
OCTOBER	...	...	...	2·5	4·6	2·8
NOVEMBER	...	...	...	2·3	4·5	2·8
DECEMBER	...	...	...	2·0	4·8	2·7
MEAN FOR YEAR				2·3	4·2	3·2

MASAKA Meteorological Statement for the Year 1921.

Lat. 0° 21' S.

Long. 31° 47' E.

Height above M.S.L. 4150—4250 feet.

MONTH.	7 A.M.		2 P.M.		9 P.M.		Maximum Tempera- ture.	Minimum Tempera- ture.	Rain.	No. of days rain fell.
	Dry Bulb.	Wet Bulb.	Dry Bulb.	Wet Bulb.	Dry Bulb.	Wet Bulb.				
	o	o	o	o	o	o				
JANUARY ...	63.5	62.0	76.9	68.0	67.0	63.8	79.0	61.8	1.89	7
FEBRUARY ...	63.4	61.1	76.6	67.1	66.4	63.5	78.8	61.4	1.82	8
MARCH ...	63.1	60.7	79.2	68.5	67.5	64.2	80.9	62.6	4.02	13
APRIL ...	63.8	62.4	76.0	69.1	67.7	65.0	77.8	62.4	8.91	24
MAY ...	63.0	61.9	73.6†	68.7†	66.4	64.7	76.1	61.6	4.96	15
JUNE ...	62.4†	60.2†	73.9†	66.8†	66.4*	64.2*	78.0*	59.5†	.57	5
JULY ...	64.7†	62.3†	74.1*	66.1*	62.7*	60.6*	78.3*	59.1*	2.09	3
AUGUST ...	64.2	62.1	73.9	66.3	63.6	61.9	78.9	58.6	3.24	7
SEPTEMBER ...	64.2	62.2	74.5	66.4	64.2	62.8	79.0	58.8	2.90	7
OCTOBER ...	64.0	62.0	75.8	67.1	63.7	62.3	79.1	59.2	3.35	11
NOVEMBER ...	65.1	63.1	74.9	66.9	63.9	62.4	79.0	59.7	1.92	5
DECEMBER ...	63.9	62.3	76.9	69.2	66.6	63.3	80.3	65.4	3.58	8
MEAN FOR YEAR	63.8	61.9	75.5	67.5	65.5	63.2	78.7	60.8	TOTAL 39.25	113

(*) Records for 26 days.

(†) Records for 27 days.

(‡) Records for 28 days.

JINJA Meteorological Statement for the Year 1921.

Lat. 0° 26' N.

Long. 33° 11' E.

Height above M.S.L. 3722 feet.

MONTH.	7 A.M.		2 P.M.		9 P.M.		Maximum Tempera- ture.	Minimum Tempera- ture.	Rain.	No. of days rain fell.
	Dry Bulb.	Wet Bulb.	Dry Bulb.	Wet Bulb.	Dry Bulb.	Wet Bulb.				
	o	o	o	o	o	o				
JANUARY ...	66.2	65.2	81.9	69.8	67.0	64.9	87.0	64.8	1.38	3
FEBRUARY ...	65.1	64.4	79.1	71.7	68.3	66.5	86.6	60.9	2.76	7
MARCH ...	65.4	64.0	77.7	69.7	67.6	65.2	85.6	64.4	1.75	7
APRIL ...	64.8	63.2	81.0	76.6	65.6	63.4	85.0	62.5	4.68	14
MAY ...	67.3	65.7	79.5	69.7	67.3	65.3	82.5	64.2	3.78	11
JUNE ...	67.6	65.5	79.6	68.9	66.3	63.6	80.1	62.3	1.31	5
JULY ...	65.7	63.4	70.9	64.0	64.6	61.2	79.1	60.0	3.27	7
AUGUST ...	65.9	63.5	76.1	66.3	65.2	60.9	79.1	61.1	6.34	9
SEPTEMBER ...	66.4	64.1	76.1	67.7	62.6	60.7	80.9	60.8	2.20	7
OCTOBER ...	65.6	63.8	78.5	65.5	66.1	62.2	81.7	61.0	2.82	10
NOVEMBER ...	65.9	64.1	78.1	71.9	76.0	65.0	82.3	61.1	3.79	14
DECEMBER ...	65.7	64.4	81.0	78.1	67.6	61.3	84.2	60.7	3.52	7
MEAN FOR YEAR	65.9	64.2	78.8	69.9	67.0	63.3	82.8	61.9	TOTAL 37.60	101

MBARARA Meteorological Statement for the Year 1921.

Lat. 0° 31' S.

Long. 30° 47' E.

Height above M.S.L. 4500 feet.

			7 A.M.		2 P.M.					
MONTH.			Dry Bulb.	Wet Bulb.	Dry Bulb.	Wet Bulb.	Maximum Temperature.	Minimum Temperature.	Rain.	No. of days rain fell.
			o	o	o	o	o	o	o	
JANUARY	...	...	65.6	62.3	77.9	69.0	79.7	55.2	2.49	8
FEBRUARY	..	...	64.5	62.2	76.9	71.3	80.5	56.7	3.13	5
MARCH	...	...	67.0	63.3	77.8	68.9	81.6	57.3	2.98	8
APRIL	..	...	69.3	63.9	80.4	69.9	83.7	59.3	4.55	10
MAY	...	...	65.5	63.0	77.8	68.8	83.5	56.5	2.72	6
JUNE	...	...	65.1	61.6	77.8	66.8	84.0	54.8	.20	2
JULY	...	...	66.6	62.8	75.8	66.0	85.1	53.5	1.96	6
AUGUST	...	...	65.9	62.4	76.5	67.4	85.8	54.0	2.36	5
SEPTEMBER	...	...	67.1	63.7	76.8	69.0	85.4	56.7	2.63	10
OCTOBER	...	...	66.9	64.5	74.7	68.1	81.5	56.3	6.26	15
NOVEMBER	...	...	66.3	64.2	74.2	69.4	81.0	55.3	3.34	13
DECEMBER	...	...	65.3	62.9	78.9	73.5	82.3	57.9*	.91	5
MEAN FOR YEAR			66.3	63.1	77.1	69.0	82.8	56.1	TOTAL 33.53	93

(*) Records for 16 days.

FORT PORTAL Meteorological Statement for the Year 1921.

Lat. 0° 43' N. Long. 30° 8' E. Height above M.S.L. 5299 feet.

MONTH.	7 A.M.		2 P.M.		Maximum Temperature.	Minimum Temperature.	Rain.	No. of days rain fell
	Dry Bulb.	Wet Bulb.	Dry Bulb.	Wet Bulb.				
	o	o	o	o	o	o	In.	
JANUARY ...	62.0	60.7	73.9	63.5	82.5	57.0	Nil	—
FEBRUARY ...	64.1	60.7	73.8	63.8	82.1	56.6	0.78	6
MARCH ...	63.1	60.5	76.8	66.1	83.1	55.7	4.17	9
APRIL ...	63.6	60.2	75.8	67.3	80.5	55.4	6.95	15
MAY ...	65.8	61.6	73.7	65.6	79.9	54.3	9.50	18
JUNE ...	61.8	59.9	72.6	64.9	75.5	56.7	3.27	8
JULY ...	60.0	59.0	70.9	63.8	74.4	54.5	2.27	10
AUGUST ...	63.8	61.3	71.2	64.4	74.8	55.4	5.37	14
SEPTEMBER ...	62.5	60.0	72.0	64.3	76.0	53.5	8.81	22
OCTOBER ...	64.3	62.2	70.4	64.9	75.9	55.5	8.95	22
NOVEMBER ...	64.2	61.9	74.5	66.7	77.7	54.5	3.91	15
DECEMBER ...	62.5	58.6	76.0	68.8	78.9	55.7	1.62	5
MEAN FOR YEAR ...	63.1	60.6	73.5	65.3	78.4	55.4	TOTAL 55.60	144

GULU Meteorological Statement for the Year 1921.

Lat. 2° 45' N. Long. 32° 25' E.

MONTH.	7 A.M.		2 P.M.		Maximum Temperature.	Minimum Temperature.	Rain.	No. of days rain fell
	Dry Bulb.	Wet Bulb.	Dry Bulb.	Wet Bulb.				
	o	o	o	o	o	o	In.	
JANUARY ...	70.9	65.2	85.7	69.5	86.3	60.1	1.19	3
FEBRUARY ...	71.2	65.0	85.4	71.3	86.4	62.3	1.85	8
MARCH ...	71.8	65.8	89.4	70.6	91.2	62.4	1.26	8
APRIL ...	71.8	66.5	86.9	69.9	89.3	62.5*	4.83	14
MAY ...	70.4	66.2	82.5	70.2	84.9	—	9.78	16
JUNE ...	68.5	65.4	—	—	81.0	62.6†	6.07	15
JULY ...	67.6	64.4	76.4	68.9	79.7	62.0	5.32	14
AUGUST ...	67.2	64.6	77.9	69.2	80.7	61.4	5.70	11
SEPTEMBER ...	68.2	64.8	81.7	68.9	84.0	61.9	2.15	5
OCTOBER ...	69.6	64.7	82.2	69.6	85.3	62.0	10.79	10
NOVEMBER ...	69.5	65.7	83.9	72.9	86.2	62.7	5.34	8
DECEMBER ...	75.6	68.0	86.2	80.0	86.7	61.6	1.18	2
MEAN FOR YEAR ...	70.2	65.5	83.4	71.0	85.1	62.0	TOTAL 51.46	114

* Records for 20 days; † Records for 25 days.

KAMPALA Meteorological Statement for the Year 1921.

Lat. 0° 19' N. Long. 32° 35' E. Height above M.S.L. 3903 feet.

MONTH.	7 A.M.		2 P.M.		Maximum Temperature.	Minimum Temperature.	Rain.	No. of days rain fell.
	Dry Bulb.	Wet Bulb.	Dry Bulb.	Wet Bulb.				
	o	o	o	o	o	o	In.	
JANUARY ...	65.4	64.5	84.0	77.0	86.6	63.4	2.19	9
FEBRUARY ...	65.8	64.8	82.0	76.9	84.9	64.0	1.68	14
MARCH ...	66.8	65.8	82.6	77.2	85.3	64.9	2.99	14
APRIL ...	67.5	66.4	81.0	75.3	83.5	65.2	5.63	18
MAY ...	66.2	65.1	77.9	74.1	80.6	64.2	2.97	24
JUNE ...	64.9	63.8	77.7	73.7	79.5	62.9	2.57	13
JULY ...	63.6	62.5	75.4	72.2	77.5	61.4	4.05	15
AUGUST ...	64.0	62.9	74.8	71.7	78.5	61.9	2.30	21
SEPTEMBER ...	64.5	63.4	80.4	75.1	83.3	62.4	1.74	15
OCTOBER ...	64.6	63.2	80.0	71.6	84.2	62.7	7.25	17
NOVEMBER ...	65.5	64.4	82.0	73.5	86.5	63.8	8.00	17
DECEMBER ...	65.8	64.0	87.1	73.5	89.3	63.1	2.26	9
MEAN FOR YEAR ...	65.4	64.2	80.4	74.3	83.3	63.3	TOTAL 43.63	186

MUBENDI Meteorological Statement for the Year 1921.

Lat. 0° 30' 26" N.

Long. 31° 22' 22" E.

Height above M.S.L. 5121 feet.

MONTH.	7 A.M.		2 P.M.		9 P.M.		Maximum Tempera- ture.	Minimum Tempera- ture.	Rain.	No. of days rain fell.
	Dry Bulb.	Wet Bulb.	Dry Bulb.	Wet Bulb.	Dry Bulb.	Wet Bulb.				
	o	o	o	o	o	o	o	o	In.	
JANUARY ...	67·9	61·6	75·8	64·1	73·4	62·9	76·6	64·3	1·65	7
FEBRUARY ...	65·5	61·7	75·0	64·0	69·6	62·7	76·8	62·3	2·63	7
MARCH ...	64·1	61·1	70·0	64·4	64·0	61·3	74·6	62·6	4·35	13
APRIL ...	65·2	62·2	67·6	64·4	65·2	62·5	74·8	62·0	4·20	16
MAY ...	64·7	61·3	70·0	64·4	65·2	62·3	75·2	62·7	2·57	8
JUNE ...	63·6	60·5	71·3	64·7	64·3	61·7	72·3	62·2	5·01	7
JULY ...	63·9	60·3	72·5	62·6	66·9	61·3	75·4	63·8	1·14	6
AUGUST ...	66·3	61·7	70·6	63·2	66·2	60·6	72·2	66·4	5·75	12
SEPTEMBER	65·5	62·4	71·6	64·8	68·4	63·5	73·0	64·2	6·45	11
OCTOBER ...	64·7	61·2	72·5	65·8	67·4	63·2	—	—	11·40	17
NOVEMBER ...	65·9	61·7	74·2	65·6	67·1	61·5	75·4	64·1	1·98	6
DECEMBER ...	66·0	62·3	77·8	68·7	68·4	63·2	80·2	63·4	1·46	4
MEAN FOR YEAR	65·3	61·5	72·4	64·7	67·2	62·2	75·1	63·5	TOTAL 48·59	114

MASINDI Meteorological Statement for the Year 1921.

Lat. 1° 40' N.

Long. 31° 50' E.

Height above M.S.L. 3764 feet.

MONTH.			Maximum Temperature.	Minimum Temperature.	Rain.	No. of days rain fell.
			o	o	In.	
JANUARY	...	...	85·5	59·3	Nil	Nil
FEBRUARY	...	...	84·0	62·2	1·34	4
MARCH	...	...	87·5	62·4	4·16	9
APRIL	...	...	88·3	61·2	6·32	11
MAY	...	...	86·4	67·9	7·08	14
JUNE	...	...	84·1	57·4	2·64	10
JULY	...	...	81·2	60·2	6·40	14
AUGUST	...	...	81·2	53·1	5·74	14
SEPTEMBER	...	...	84·1	60·0	3·36	11
OCTOBER	...	...	83·5	60·8	4·14	11
NOVEMBER	...	...	—	—	—	—
DECEMBER	...	...	86·2	59·3	1·92	6
MEAN FOR YEAR ...			84·7	60·3	TOTAL 43·10	105

SERERE Meteorological Statement for the Year 1921.

Lat. 1° 31' N. Long. 33° 27' E. Height above M.S.L. 3600 feet.

MONTH.	Maximum Tempera- ture.	Minimum Tempera- ture.	Rain.	Number of days rain fell.
	o	o	In.	
JANUARY...	91·3	66·0	·68	4
FEBRUARY	91·6	66·6	1·60	6
MARCH ...	94·8	67·3	·72	4
APRIL ..	92·9	67·3	4·32	8
MAY ...	89·3	66·0	5·88	13
JUNE ...	87·2	64·5	5·99	11
JULY ...	82·7	63·2	9·56	14
AUGUST ...	85·5	63·2	2·61	7
SEPT. ..	87·5	63·6	5·01	10
OCTOBER...	89·5	61·1	4·63	13
NOVEMBER	89·1	63·1	1·54	6
DECEMBER	90·1	69·7	·56	3
MEANS ...	89·3	65·1	41·00	99

BUKALASA Meteorological Statement for the Year 1921.

Lat. 0° 43' N. Long. 33° 27' E. Height above M.S.L. 3700 feet.

MONTH.	Maximum Tempera- ture.	Minimum Tempera- ture.	Rain.	Number of days rain fell.
	o	o	In.	
JANUARY	88·9	61·6	2·48	5
FEBRUARY	87·7	62·4	2·37	7
MARCH ...	88·0	62·0	2·10	12
APRIL ...	84·7	63·3	6·78	16
MAY ...	83·1	62·6	5·22	15
JUNE ...	81·8	61·6	5·53	10
JULY ...	81·7	59·4	2·30	6
AUGUST ...	82·5	60·1	2·11	14
SEPT. ...	87·2	60·5	3·18	15
OCTOBER...	85·3	62·2	6·79	18
NOVEMBER	84·5	62·4	4·63	15
DECEMBER	87·0	63·0	1·70	6
MEANS ..	85·2	61·8	45·19	138

Comparative Rainfall Statement, showing the Monthly Rainfall for the Year 1921, of Forty-five Localities of the Uganda Protectorate.

MONTH.	Entebbe.		Jinja.		Mbarara.		Masaka.		Fort Portal.		Butiaba.		Masindi.		Gulu.		Kampala.		Mbale.		Mubendi.		Budo.	
	In.	No. of days	In.	No. of days	In.	No. of days	In.	No. of days	In.	No. of days	In.	No. of days	In.	No. of days	In.	No. of days	In.	No. of days	In.	No. of days	In.	No. of days	In.	No. of days
JANUARY	2.18	6	1.38	3	2.49	8	1.89	7	Nil	Nil	Nil	Nil	Nil	Nil	0.19	3	2.19	9	0.60	4	1.65	7	0.97	9
FEBRUARY	1.86	8	2.76	7	3.13	5	1.82	8	0.78	6	1.40	2	1.34	4	1.85	8	1.68	14	5.20	12	2.63	7	2.37	12
MARCH	4.67	12	1.75	7	2.98	8	4.02	13	4.17	9	0.40	3	4.16	9	1.26	8	2.99	14	0.88	5	4.35	13	2.55	13
APRIL	8.87	17	4.68	14	4.55	10	8.91	24	6.35	15	Nil	Nil	6.32	11	4.83	14	3.43	18	3.43	15	4.20	16	5.91	12
MAY	6.76	17	3.78	11	2.72	6	4.96	15	9.50	18	Nil	Nil	7.08	15	9.78	16	2.97	24	5.58	19	2.57	8	5.72	11
JUNE	6.43	10	1.31	5	0.20	2	0.87	5	3.27	8	2.24	6	2.64	10	6.07	15	2.57	13	5.75	16	5.01	7	3.22	8
JULY	1.74	10	3.27	7	1.96	6	2.09	3	2.27	10	0.55	2	6.40	14	5.32	14	4.05	15	6.27	17	1.14	6	1.10	8
AUGUST	2.18	9	6.34	9	2.36	5	3.24	7	5.37	14	3.37	4	5.74	11	5.70	11	2.30	21	4.89	21	5.75	12	4.88	17
SEPTEMBER	3.06	10	2.20	7	2.63	10	2.90	7	8.31	22	4.86	5	3.36	11	2.15	5	1.74	15	Nil	Nil	6.45	11	2.72	12
OCTOBER	4.04	10	2.82	10	6.26	15	3.35	11	8.95	22	2.95	5	4.14	11	10.79	10	7.25	17	Nil	Nil	11.40	17	3.60	13
NOVEMBER	5.15	12	3.79	14	3.34	13	1.92	5	3.91	15	2.17	5	No records		3.34	8	8.00	17	Nil	Nil	1.98	6	13.33	16
DECEMBER	5.01	12	3.52	7	0.91	5	3.58	8	1.62	5	Nil	Nil	1.92	6	0.18	2	2.26	9	0.86	Nil	1.46	4	2.46	7
TOTAL	51.95	133	37.60	101	33.53	93	39.25	113	55.60	144	17.94	32	43.10	105	51.46	114	43.63	186	32.96	109	48.59	114	45.83	138

MONTH.	Bukona.		Lira.		Soroti.		Hoima.		Namuokekera.		Butiti.		Bukumi.		Rubaga.		Ng'ora.		Kisubi.		Kivuvu.	
	In.	No. of days	In.	No. of days	In.	No. of days	In.	No. of days	In.	No. of days	In.	No. of days	In.	No. of days	In.	No. of days	In.	No. of days	In.	No. of days	In.	No. of days
JANUARY	1.07	5	Nil	Nil	0.87	2	0.22	3	0.40	3	0.73	4	1.92	4	1.85	2	4.10	1	1.44	3	0.25	2
FEBRUARY	7.05	10	3.36	6	2.58	7	0.69	9	1.59	6	0.66	5	1.82	7	3.24	4	1.56	4	3.47	5	4.44	9
MARCH	4.15	9	1.14	6	0.37	1	3.35	7	2.14	6	2.82	10	1.82	4	2.12	5	0.16	2	3.50	6	6.36	9
APRIL	4.67	15	3.28	10	2.53	8	9.87	19	6.09	11	7.87	15	6.27	10	6.10	11	5.34	10	7.19	8	4.40	9
MAY	Nil	Nil	9.27	14	4.93	15	4.99	17	2.21	5	6.47	11	3.75	8	2.68	7	6.30	10	5.09	8	7.78	16
JUNE	Station closed		7.21	12	6.17	12	4.77	11	3.04	7	1.60	7	2.41	6	2.36	7	4.53	9	5.01	9	1.91	8
JULY	on		4.36	11	7.43	10	7.09	12	2.81	7	3.51	10	5.48	6	2.30	3	6.64	14	1.40	4	4.01	8
AUGUST	30th		7.22	9	9.74	13	2.61	13	4.30	11	8.74	8	7.13	11	2.22	4	1.32	11	1.32	5	4.50	11
SEPTEMBER	"		5.87	7	2.39	12	6.12	18	4.14	9	7.11	13	7.11	11	3.74	5	1.86	8	1.28	2	3.22	4
OCTOBER	"		3.87	7	4.05	14	8.07	20	Nil	Nil	6.93	18	4.86	8	7.83	11	4.71	12	4.16	5	4.02	9
NOVEMBER	April 1921.		0.75	6	1.71	7	5.65	15	"	"	6.93	9	3.81	8	6.24	11	3.85	11	2.26	3	2.26	8
DECEMBER	"		0.20	1	0.10	1	1.19	4	0.84	"	1.63	10	2.39	5	1.82	4	0.51	1	3.28	5	3.32	4
TOTAL	16.94	39	46.53	89	42.87	102	54.62	143	27.56	67	46.83	120	47.88	88	42.50	74	42.78	90	39.40	63	47.64	97

COMPARATIVE RAINFALL STATEMENT, SHOWING THE MONTHLY RAINFALL FOR THE YEAR 1921,
OF FORTY-FIVE LOCALITIES OF THE UGANDA PROTECTORATE—continued.

MONTH.	Magiye.		Nandere.		Moniko.		Bombo.		Bwau.		Kakumiro.		Bunyaru-guru.		Katigondo.		Masindi Port.		Kitgum.		Kilchoony.		Namasagali.		Hoima River Estate.	
	In.	No. of days	In.	No. of days	In.	No. of days	In.	No. of days	In.	No. of days	In.	No. of days	In.	No. of days	In.	No. of days	In.	No. of days	In.	No. of days	In.	No. of days	In.	No. of days	In.	No. of days
JANUARY	Nil	—	0.79	3	0.12	1	0.71	4	1.82	8	2.06	5	2.61	10	1.15	5	0.14	4	0.13	2	2.15	6	Nil	Nil	0.21	3
FEBRUARY	4.78	7	2.14	8	2.45	8	3.02	9	3.07	15	1.64	5	2.42	7	4.46	7	0.83	7	9.35	0	1.06	7	1.48	10	2.40	7
MARCH	1.42	—	1.88	5	4.68	10	3.09	5	2.79	10	3.33	9	2.19	9	2.02	9	1.55	7	0.59	0	1.48	5	2.17	8	2.59	9
APRIL	5.60	—	5.38	13	6.21	10	5.17	13	7.20	17	6.07	14	9.45	28	7.73	12	7.10	14	1.72	7	8.09	20	4.52	11	4.58	15
MAY	7.34	—	6.18	10	3.36	8	7.24	12	4.75	16	3.46	17	4.91	14	4.94	12	5.94	12	5.17	10	5.09	18	3.53	12	9.00	17
JUNE	1.57	—	6.36	11	3.33	8	8.50	11	2.53	15	5.17	12	3.20	8	0.35	5	2.24	11	4.00	12	3.07	11	5.00	15	4.21	16
JULY	2.72	—	3.14	7	3.05	4	3.10	10	6.03	14	4.04	6	0.84	8	0.62	1	9.83	12	2.72	11	2.63	11	1.96	13	9.93	13
AUGUST	5.67	—	7.47	10	3.17	8	3.86	17	5.21	13	7.01	16	3.94	9	2.88	3	3.68	12	6.53	14	5.96	18	4.95	10	4.40	13
SEPTEMBER	3.86	8	2.89	6	3.53	5	4.48	14	3.90	8	5.85	19	7.14	9	2.06	9	3.11	16	5.68	12	7.96	23	3.29	10	8.09	17
OCTOBER	2.97	14	4.93	10	3.39	8	7.55	17	9.77	17	8.38	20	4.97	12	4.32	12	2.56	13	5.83	9	12.19	25	7.82	20	7.49	21
NOVEMBER	4.71	13	2.64	11	4.69	8	7.72	19	7.14	15	4.76	13	2.61	7	5.75	12	5.02	12	1.00	15	4.38	15	4.48	14	7.84	15
DECEMBER	2.11	7	2.25	5	2.82	5	2.45	7	3.06	6	1.47	7	2.69	4	2.79	7	0.68	6	0.33	2	1.03	7	Nil	Nil	1.05	6
TOTAL	42.75	—	46.05	99	40.80	83	51.89	138	57.30	154	53.24	143	46.97	125	38.57	94	42.68	116	43.05	82	55.09	166	39.20	123	61.79	152

MONTH.	Nyondo.		Mutai.		Nsambya.		Bugondo.		Lale.		Kabale.		Buye Estate.		Bukalasa.		Serere.	
	In.	No. of days	In.	No. of days	In.	No. of days	In.	No. of days	In.	No. of days	In.	No. of days	In.	No. of days	In.	No. of days	In.	No. of days
JANUARY	0.98	3	3.01	2	1.25	3	Nil	3	0.30	3	1.75	8	0.72	5	2.48	5	0.68	4
FEBRUARY	3.59	12	5.35	5	2.02	7	0.53	2	0.30	2	2.68	7	1.71	10	2.97	7	1.60	6
MARCH	2.80	4	2.22	4	2.67	13	0.72	4	1.82	4	2.01	7	1.62	11	2.10	12	0.72	4
APRIL	4.60	19	4.85	7	5.58	15	4.51	8	3.02	9	4.68	11	6.51	15	6.78	16	4.32	8
MAY	5.24	15	5.11	6	2.90	12	2.62	6	6.42	14	1.03	5	3.53	12	5.22	15	5.88	13
JUNE	3.11	15	4.20	4	2.62	7	1.55	5	3.24	11	0.21	1	4.18	9	5.53	9	5.99	11
JULY	5.23	10	6.22	8	1.55	9	12.17	9	7.49	14	0.06	1	5.79	8	2.30	6	9.56	14
AUGUST	3.96	14	4.23	7	3.16	13	2.64	3	1.85	12	1.58	4	—	—	2.11	14	2.61	7
SEPTEMBER	5.56	15	3.65	4	1.12	8	2.96	4	8.94	14	1.23	7	2.58	10	3.18	15	5.01	11
OCTOBER	3.82	6	3.01	8	4.14	13	4.19	7	6.99	5	5.23	17	5.26	13	6.79	18	4.63	13
NOVEMBER	2.23	7	3.99	7	4.73	10	3.72	9	3.72	9	4.26	10	4.30	13	4.63	15	—	—
DECEMBER	0.75	1	3.10	3	1.99	6	0.65	2	0.91	3	0.36	3	2.3	6	1.70	6	—	—
TOTAL	41.87	121	48.94	65	33.73	114	34.88	57	40.00	103	25.08	81	38.51	112	45.19	138	41.00	91

**Statement showing Situations and Latitudes, Longitudes and Heights
of the Meteorological Stations in the Uganda Protectorate.**

<i>Station.</i>	<i>Situation.</i>	<i>Latitude.</i>	<i>Longitude.</i>	<i>Height in feet above Mean Sea Level.</i>
Bombo	Buganda Province	0°35' N.	32°32' E.	3967 (Approx.)
Budo	" "	0°16' N.	32°29' E.	4200—4300
Bugondo	Eastern "	1°37' N.	33°17' E.	3500
Bukalasa	Buganda "	0°43' N.	32°30' E.	3700
Bukona	Eastern "	0°30' N.	33°37' E.	—
Bukumi	Buganda "	0°49' N.	31°22' E.	4200
Bunyaruguru	Western "	0°14' S.	30°00' E.	3200
Butiaba	Northern "	1°50' N.	31°26' E.	2025
Butiti	Western "	0°39' N.	30°32' E.	—
Buye	Buganda "	0°12' N.	32°00' E.	4270
Bwavyu	" "	0°21' N.	33° 1' E.	4200 (Approx.)
Entebbe	" "	0° 4' 31" N.	32°28' 30" E.	3842
Fort Portal	Western "	0°43' N.	30° 8' E.	5299
Gulu	Northern "	2°45' N.	32°25' E.	—
Hoima	" "	1°30' N.	31°30' E.	3801
Hoima River Estate	" "	1°30' N.	31°21' E.	4000
Jinja	Eastern "	0°26' N.	33°11' E.	3722
Kabale	Western "	1°15' S.	29°59' 28" E.	—
Kakumiro	Buganda "	0°46' N.	31°18' E.	4511
Kampala	" "	0°19' N.	32°35' E.	3905
Katigondo	" "	0°13' S.	31°44' E.	4290
Kilclooney	Western "	0°30' N.	30°20' E.	—
Kitgum	Northern "	3°20' N.	32°55' E.	—
Kisubi	Buganda "	0°10' N.	32°33' E.	3850
Kivuvu	" "	0°23' N.	32°47' E.	3600—3700
Lale	Eastern "	1°42' N.	33°28' E.	—
Lira	" "	2°15' N.	32°55' E.	—
Magigye	Buganda "	0°29' N.	32°36' E.	3900
Masaka	" "	0°21' S.	31°47' E.	4150—4250
Masindi	Northern "	1°40' S.	31°50' E.	3764
Masindi Port	" "	1°42' N.	32°05' E.	3360
Moniko	Buganda "	0°23' N.	32°55' E.	4100
Mubendi	" "	0°30' 26" N.	31°22' 22" E.	5121
Mutai	Eastern "	0°34' N.	33°14' E.	3600
Mbale	" "	1° 2' N.	43° 6' E.	—
Mbarara	Western "	0°31' S.	30°47' E.	4500
Namasagali	Eastern "	1°00' N.	32°57' E.	3400
Namukekera	Buganda "	0°41' N.	32°14' E.	3700
Nandere	" "	0°38' N.	32°30' E.	3900 (Approx.)
Ngora	Eastern "	1°28' N.	33°48' E.	—
Nsambya	Buganda "	0°18' N.	32°34' E.	4020
Nyondo	Eastern "	1°01' N.	34°14' E.	—
Rubaga	Buganda "	0°18' N.	32°33' E.	4135
Serere	Eastern "	1°31' N.	32°27' E.	3600
Soroti	" "	1°43' N.	33°37' E.	3690

